

EMC TEST REPORT

No. 1719774STO-001, Ed. 3

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment: VaiNet Wireless Access Point
Type/Model: AP10A
Manufacturer: Vaisala Oyj
Tested by request of: Vaisala Oyj

SUMMARY

Referring to the emission limits and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards:

FCC 47 CFR Part 15: Radio frequency device, Subpart B: Unintentional radiators. Class B equipment.

ICES-003 Issue 6: Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement, Class B.

For details, see clause 2 – 4.

Date of issue: May 2, 2018

Tested by:


Matti Virkki

Approved by:


Hans Köhlén

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

Revision History

Edition	Date	Description	Changes
1	February 9, 2018	First release	
2	March 19, 2018	2nd release	Model name correction
3	May 2, 2018	3rd release	PoE measurement results added

CONTENTS

	Page
1. Client Information	4
2. Equipment under test (EUT).....	4
2.1 Identification of the EUT	4
2.2 Purpose of the test.	7
2.3 Additional information about the EUT	7
3. Test Specifications	8
3.1 Standards	8
3.2 Additions, deviations and exclusions from standards and accreditation	8
3.3 Test site	8
3.4 Mode of operation during the test	8
3.5 Compliance	9
4. Test Summary	10
5. Conducted continuous disturbances	11
5.1 Operating environment.....	11
5.2 Test set-up and test procedure	11
5.3 Measurement uncertainty.....	12
5.4 Test results, AC Power input port, Class B	13
5.5 Test results, PoE injector AC Power input port, Class B	14
5.6 Test equipment	15
6. Radiated rf Emission in the frequency-range 30 MHz – 6 GHz	16
6.1 Operating environment.....	16
6.2 Test set-up and test procedure	16
6.3 Test conditions	19
6.4 Measurement uncertainty.....	19
6.5 Test results, 30 – 1000 MHz, Class B, AC/DC adapter	20
6.6 Test results, 30 – 1000 MHz, Class B, PoE.....	21
6.7 Test results, 1 – 6 GHz, Class B	22
6.8 Test equipment	23

1. CLIENT INFORMATION

The EUT has been tested by request of

Company	Vaisala Oyj Vanha Nurmijärventie 21 01670 Vantaa Finland
Name of contact	Hilkka Heiskari-Tuohiniemi

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment	VaiNet Wireless Access Point
Type/Model	AP10A
Brand name	VAISALA
Serial Number	N1050825
Manufacturer	Vaisala Oyj
Rating	10 – 30 V
Class	I
Highest clock frequency	925 MHz

Photos of EUT

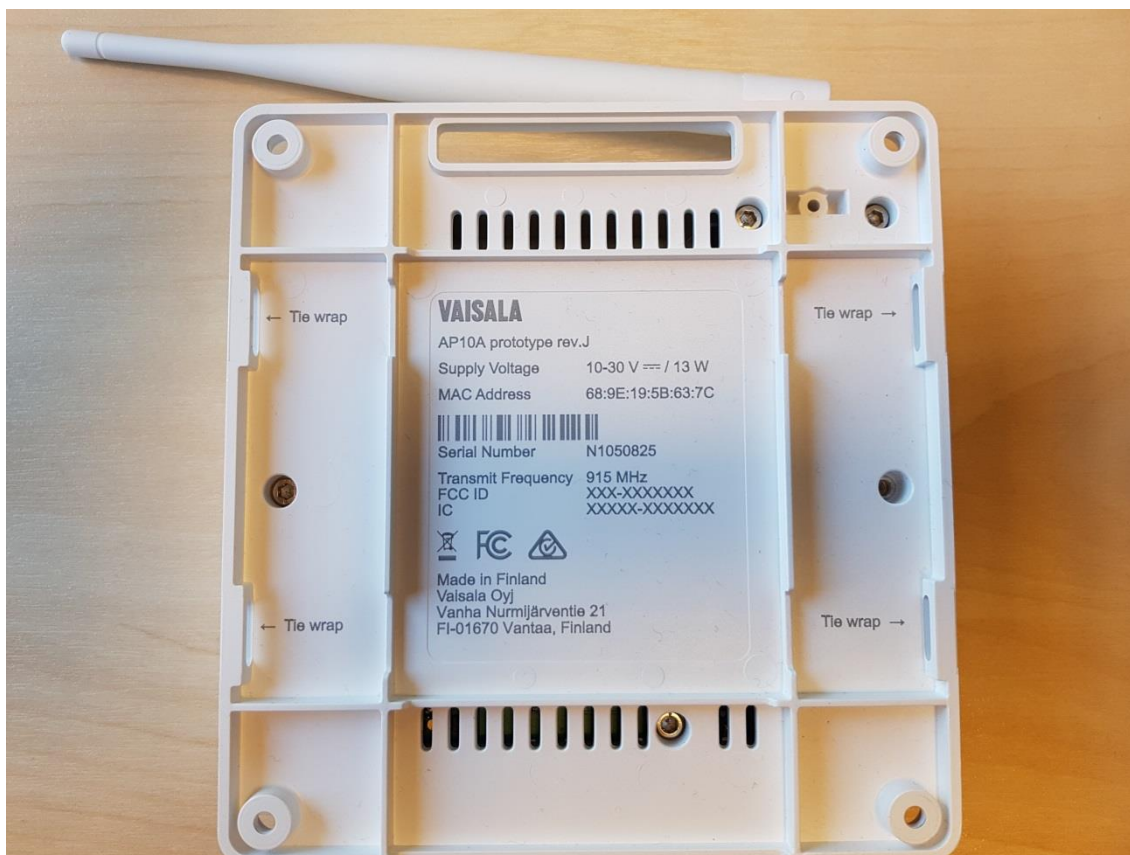




Photo of the AC/DC adapter

2.2 Purpose of the test.

The purpose of the tests was to verify that the EUT fulfills the requirements according to FCC 47 CFR Part 15 subpart B and ICES-003 Issue 6.

2.3 Additional information about the EUT

The EUT was tested in a tabletop standing configuration.

The EUT consists of the following units:

Units	Type	Serial number
Access point	AP10A	N1050825
AC/DC adapter	FW8030/24	
PoE injector	D-Link DPE-301GI	SQ021HA000135

The EUT was tested with the following cables

Port	Type	Length [m]	Specifications
AC Mains	Two-core	1	
Ethernet	CAT 6 S/FTP	3.0	
Ethernet	CAT 6 S/FTP	1	

3. TEST SPECIFICATIONS

3.1 Standards

Requirements:

FCC 47 CFR Part 15: Radio frequency device, Subpart B: Unintentional radiators.

ICES-003 Issue 6: Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement (2016).

Test methods:

ANSI C63.4: 2014: American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

3.3 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913

Intertek Semko AB is a FCC accredited conformity assessment body with designation number SE0002

Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
STORA HALLEN	Semi-anechoic 10 m and 3 m	2042G-2
5m hallen	Semi-anechoic 3m	2042G-3

3.4 Mode of operation during the test

The EUT was tested with 120 V, 60 Hz and in PoE mode.

The EUT radio was set in continuous receive mode and the EUT was connected to a PC outside the test chamber via Ethernet connection.

3.5 Compliance

The EUT shall comply with the emission limits according to the standards as listed below

Conducted emission requirements:

The EUT shall meet the limits for the standards.

Reference: 47 CFR §15.107
ICES-003, section 6.1

Limits for conducted emission according to FCC and ICES-003

Class B

Frequency range [MHz]	Limits [dBμV]	
	Quasi-Peak	Average
0.15 – 0.50	66 – 56	56 – 46
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Radiated Emission requirements:

The EUT shall meet the limits for the standards.

Reference: 47 CFR §15.109
ICES-003, section 6.2

Limits for radiated emission according to FCC and ICES-003

Class B

Frequency range [MHz]	Field strength at 3 m (dBμV/m)	Field strength at 10 m (dBμV/m)	Detector
30 – 88	40.0	29.5	Quasi Peak
88 – 216	43.5	33.0	Quasi Peak
216 – 960	46.0	35.5	Quasi Peak
960 – 1000	54.0	43.5	Quasi Peak
Above 1000	54.0 / 74.0	43.5 / 63.5	Average / Peak

The values for 10 m measuring distance are calculated by subtracting 10.5 dB from the 3 m limit.
(i.e. an extrapolation factor of 20 dB/decade according to §15.31(f)(1))

4. TEST SUMMARY

The results in this report apply only to sample tested:

Standard	Description	Result
	Emission	
FCC Part 15 subpart B ICES-003	Conducted continuous emission in the frequency range 0.150 – 30 MHz, AC Power input port The EUT complies with the Class B limits. The margin to the limit was at least 11.5 dB at 0.546 MHz See clause 5.4.	PASS
FCC Part 15 subpart B ICES-003	Conducted continuous emission in the frequency range 0.150 – 30 MHz, PoE injector AC Power input port The EUT complies with the Class B limits. The margin to the limit was at least 11.5 dB at 0.546 MHz See clause 5.5.	PASS
FCC Part 15 subpart B ICES-003	Radiated emission of electromagnetic fields in the frequency range 30 – 1000 MHz The EUT complies with the Class B limits. The margin to the limit was at least 10.2 dB at 949.98 MHz See clause 6.5.	PASS
FCC Part 15 subpart B	Radiated emission of electromagnetic fields in the frequency range 30 – 1000 MHz	
ICES-003	The EUT complies with the Class B limits. The margin to the limit was at least 10.2 dB at 949.98 MHz See clause 6.5.	
FCC Part 15 subpart B ICES-003	Radiated emission of electromagnetic fields in the frequency range 1.0 – 6 GHz The EUT complies with the Class B limits. The peak result margin to the average limit was at least 10.6 dB at 1699.9 MHz See clause 6.7	PASS

5. CONDUCTED CONTINUOUS DISTURBANCES in the frequency-range 0.15 – 30 MHz

5.1 Operating environment

Date of test:	Temperature:	Relative Humidity:
2018-02-09	23 [°C]	20 [%]
2018-04-26	23 [°C]	32 [%]

5.2 Test set-up and test procedure

The test method is in accordance with ANSI C63.4.

The EUT was connected to the power via Artificial Mains Networks AMN and Ethernet port was connected to the PC via impedance stabilizing network ISN.

The EUT was placed on an insulating support 0.8 m above the floor, 0.4 m from the vertical reference ground plane (RGP) and 0.8 m from the AMN/ISN.

Overview sweeps were performed for each lead.

During the tests the EUT was operated according to the mode of operation mentioned in clause 3.4.



Photo of the test set-up for conducted emission AC DC adapter

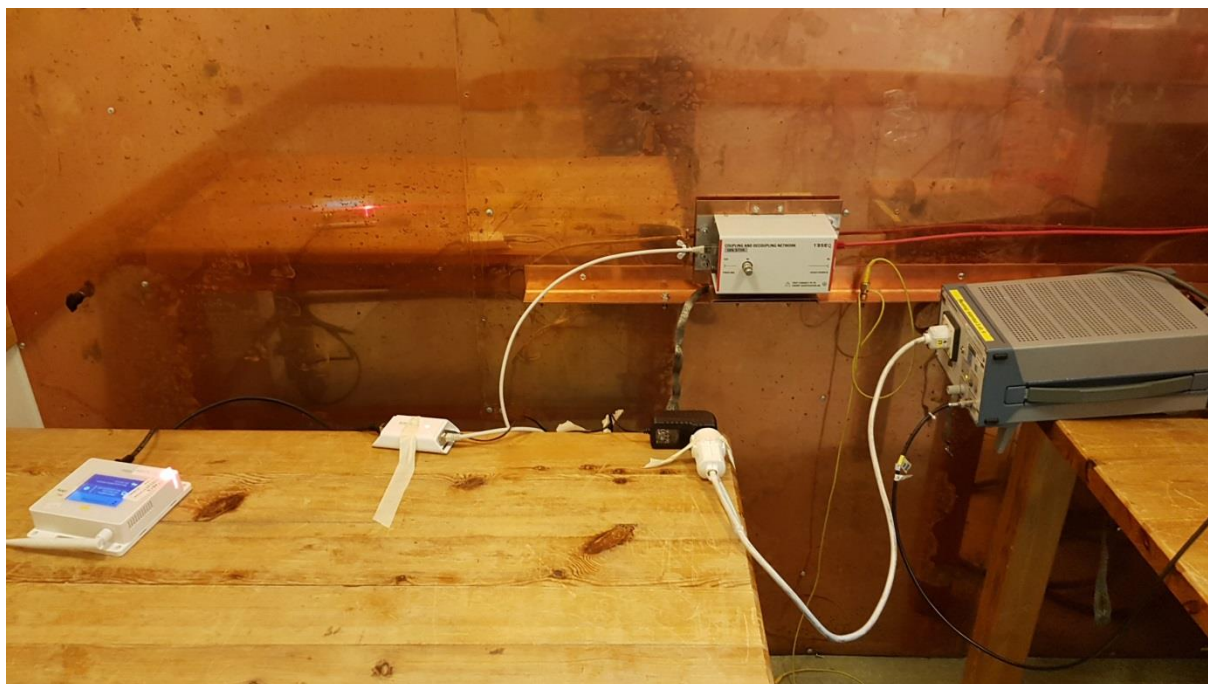


Photo of the test set-up for conducted emission with PoE injector

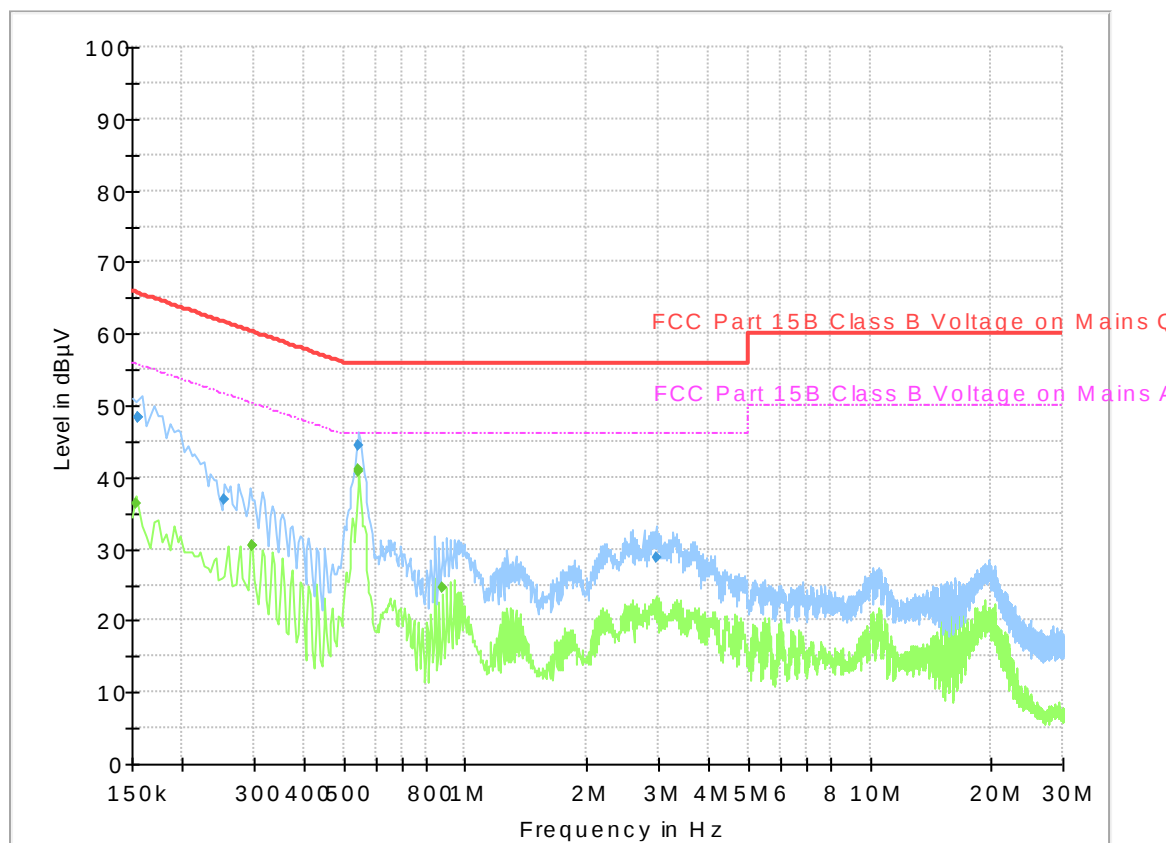
5.3 Measurement uncertainty

Continuous conducted disturbances with AMN
in the frequency range 150 kHz to 30 MHz

± 3.3 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2: 2011.
The measurement uncertainty is given with a confidence of 95 %.

5.4 Test results, AC Power input port, Class B



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

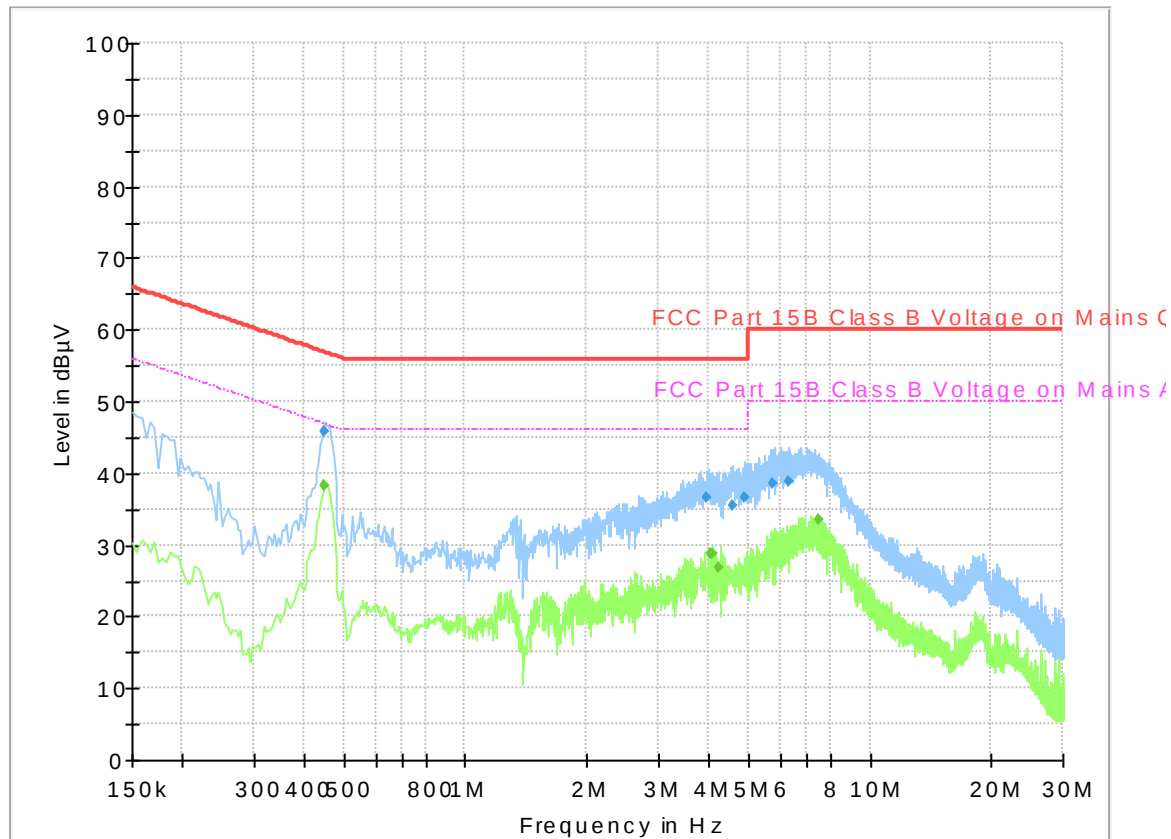
Frequency [MHz]	Level [dBμV]	Limit [dBμV]	Line L/N	Margin [dB]
0.155	48.3	65.7	N	17.4
0.156	48.4	65.7	N	17.3
0.253	37.0	61.7	N	24.7
0.546	44.5	56.0	N	11.5
2.953	28.8	56.0	N	27.2

Measurement results, Average, Class B

Frequency [MHz]	Level [dBμV]	Limit [dBμV]	Line L/N	Margin [dB]
0.154	36.5	55.8	N	19.3
0.296	30.6	50.4	N	19.8
0.290	30.4	50.3	N	19.9
0.545	41.1	46.0	N	14.9
0.546	40.9	46.0	N	15.1
0.878	24.5	56.0	N	21.5

Result [dBμV] = Analyser reading [dBμV] + cable loss [dB] + LISN insertion loss [dB]

5.5 Test results, PoE injector AC Power input port, Class B



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Level [dBμV]	Limit [dBμV]	Line L/N	Margin [dB]
0.450	45.9	56.9	N	11.0
3.957	36.7	56.0	L1	19.3
4.563	35.4	56.0	N	20.6
4.893	36.5	56.0	N	19.5
5.748	38.5	60.0	L1	21.5
6.300	38.9	60.0	N	21.1

Measurement results, Average, Class B

AV values are not reported .All QP results were below the AV limit.

Result [dBμV] = Analyser reading [dBμV] + cable loss [dB] + LISN insertion loss [dB]

5.6 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 -	--	--	--
Receiver	Rohde & Schwarz	ESCI	32702	7/2017	1 year
AMN / LISN	Rohde & Schwarz	ESH2-Z5	3017	10/2017	3 years
AMN / LISN	Rohde & Schwarz	ESH3-Z5	2727	10/2017	3 years
ISN	Teseq	ST08	32702	7/2017	1 year

6. RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHZ – 6 GHZ

6.1 Operating environment

Date of test:	Temperature:	Relative Humidity:
2018-01-23	21 [°C]	17[%]

6.2 Test set-up and test procedure

The test method is in accordance with ANSI C63.4.

The EUT was set up in order to emit maximum disturbances.

The EUT was placed on an insulating support 0.8 m above the turntable which is part of the reference ground plane.

Overview sweeps were performed with the measurement receiver in max-hold mode and the peak detector activated in the frequency-range 30 – 1000 MHz

Above 1 GHz additionally the average detector was activated.

During height scan above 1 GHz the EUT was kept in antennas cone of radiation.

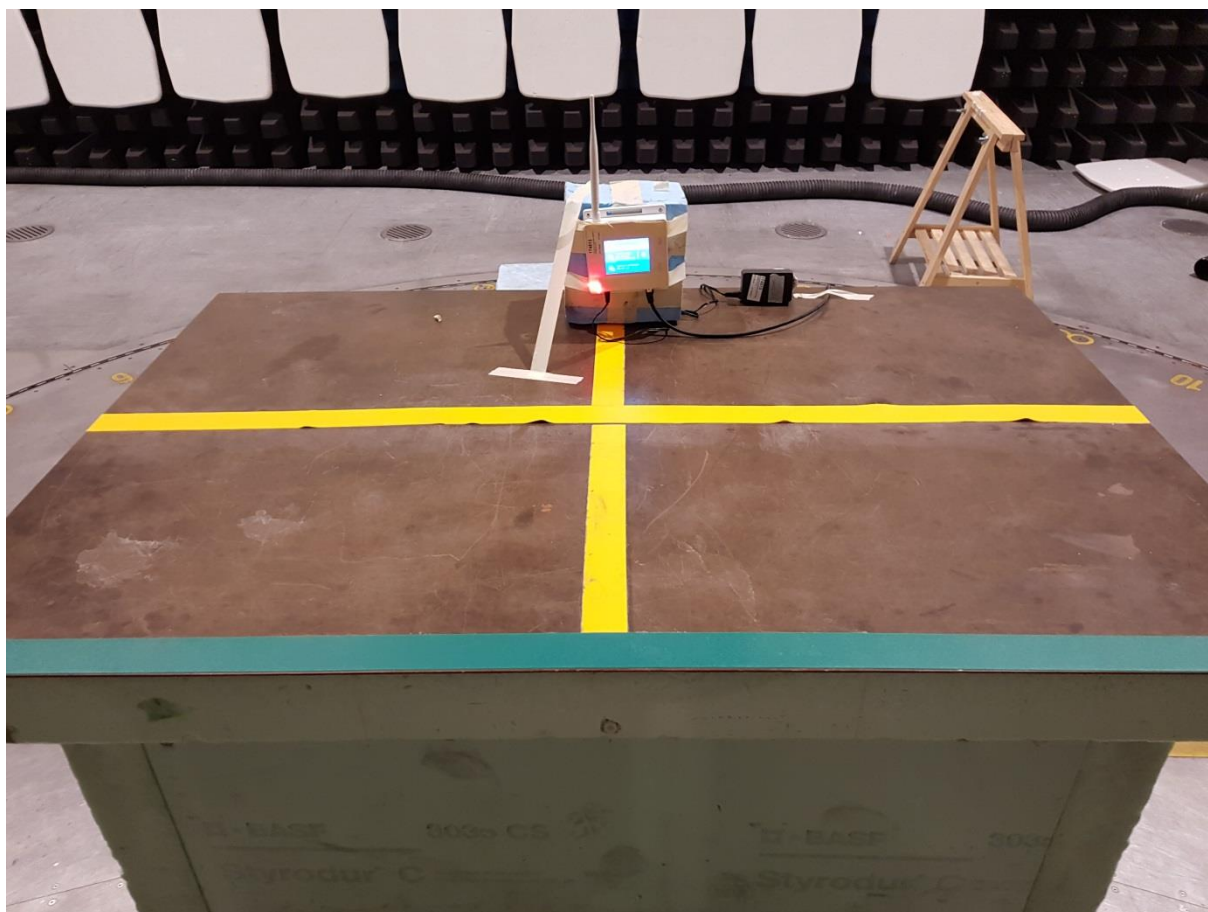


Photo of the test set-up for radiated emission

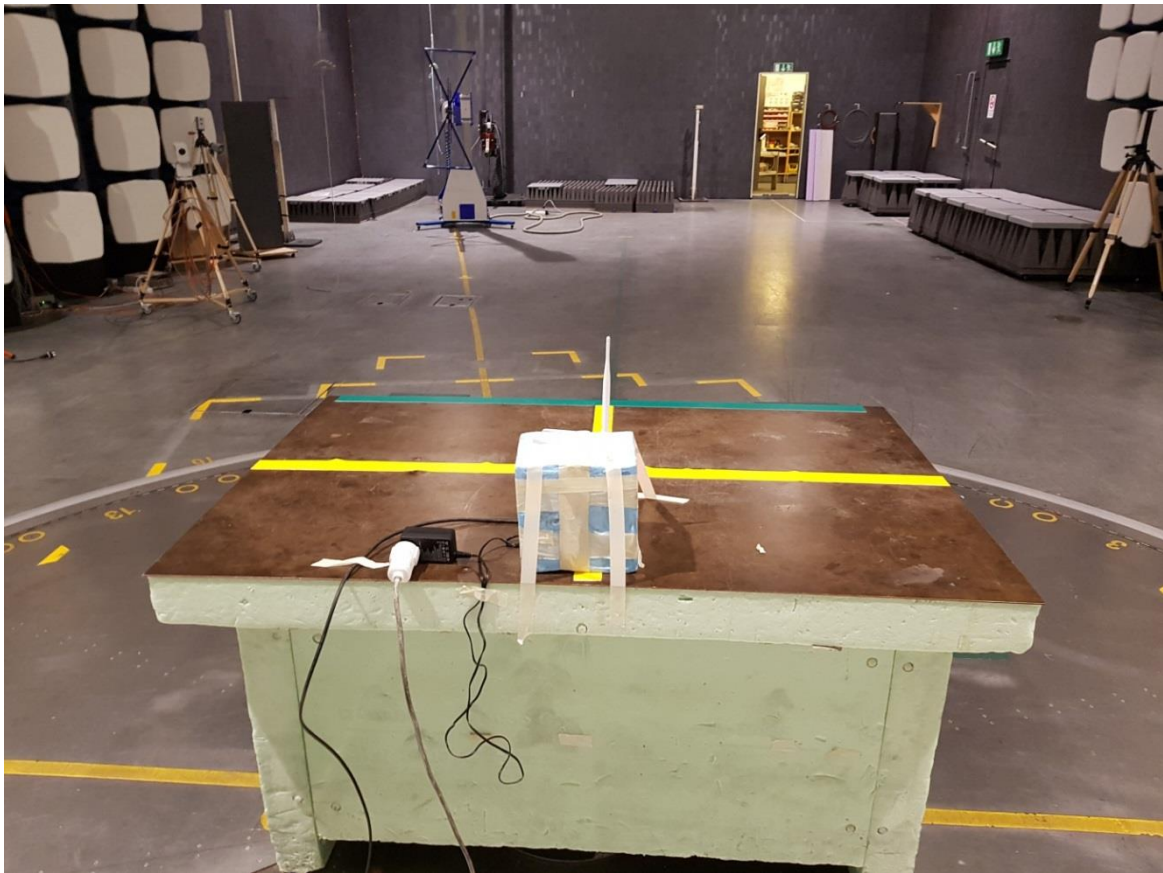


Photo of the test set-up for radiated emission 30 MHz – 1 GHz

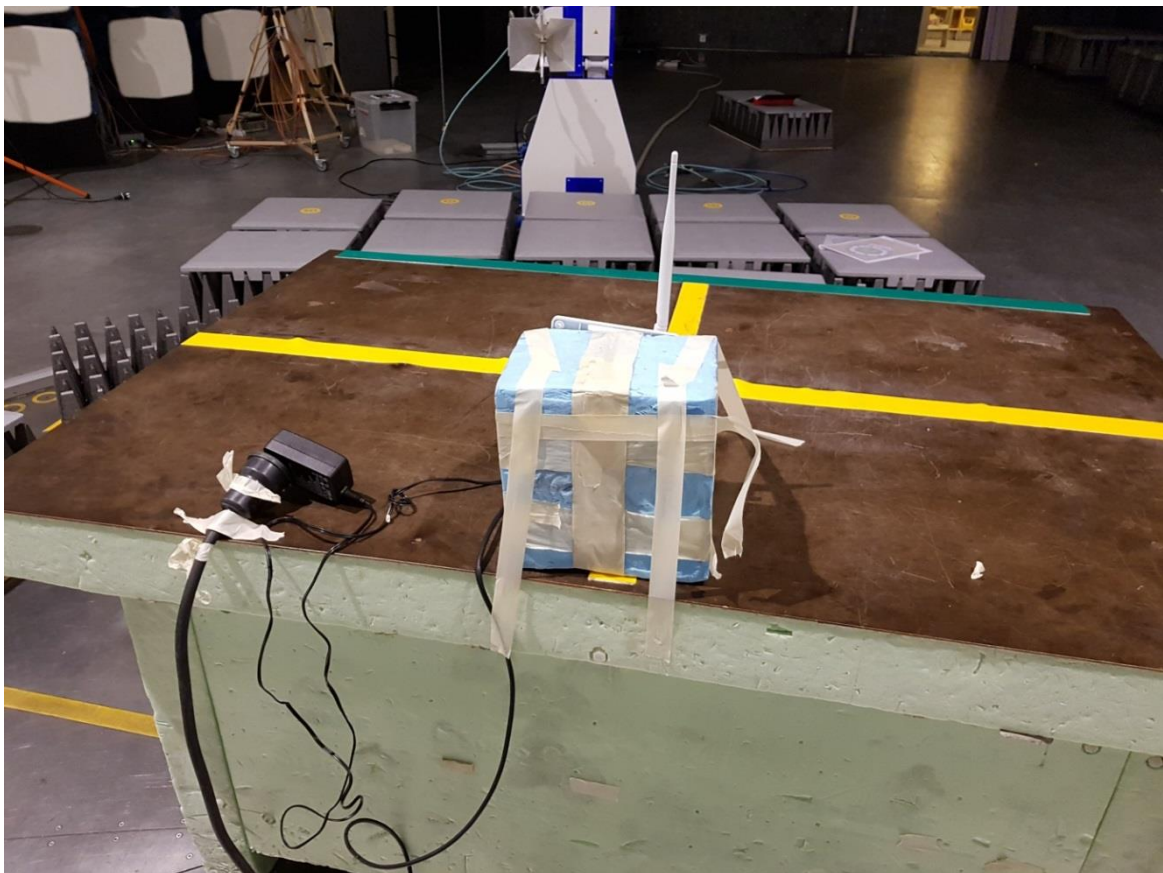


Photo of the test set-up for radiated emission 1 – 6 GHz

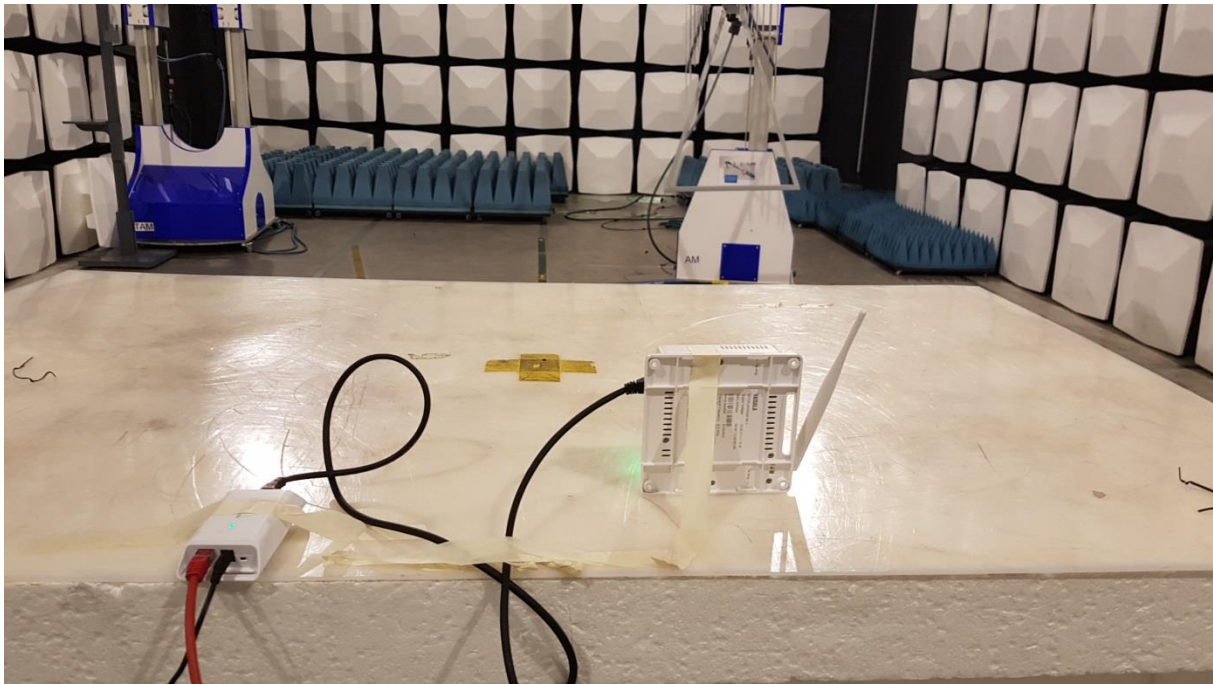


Photo of the test set-up for radiated emission 30 MHz – 1 GHz with PoE injector

6.3 Test conditions

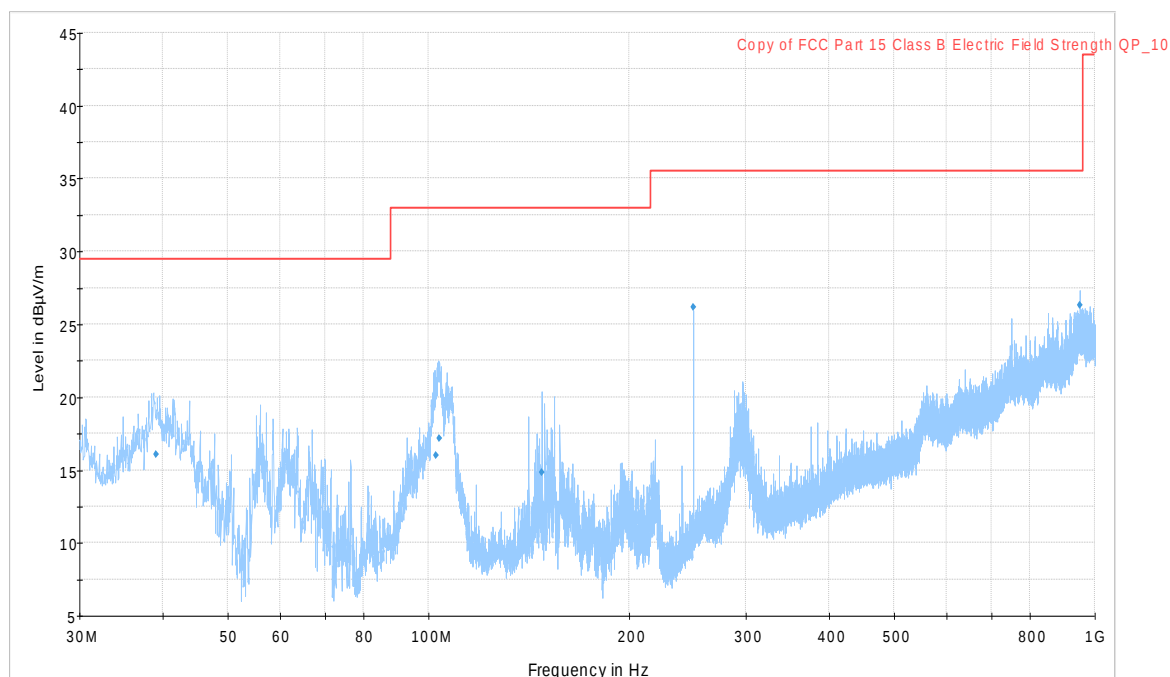
Test set-up:	30 – 1000 MHz		
Test receiver set-up:			
Preview test:	Peak,	RBW 120 kHz	VBW 1 MHz
Final test:	Quasi-Peak,	RBW 120 kHz	
Measuring distance:	10 m / 3m		
Measuring angle:	0 – 359°		
Antenna			
Height above ground plane:	1 – 4 m		
Polarisation:	Vertical and Horizontal		
Type:	Bilog		
Test set-up:	1 – 6 GHz		
Test receiver set-up:			
Preview test:	Peak,	RBW 1 MHz	VBW 3 MHz
Final test:	Average,	RBW 1 MHz	
	Peak,	RBW 1 MHz	
Measuring distance:	3 m		
Measuring angle:	0 – 359°		
Antenna			
Height above ground plane:	1 – 4 m		
Polarisation:	Vertical and Horizontal		
Type:	Horn		
Antenna tilt:	Activated		

6.4 Measurement uncertainty

Measurement uncertainty for radiated disturbance		
Uncertainty for the frequency range 30 to 1000 MHz at 10 m		± 5.0 dB
Uncertainty for the frequency range 1.0 to 18 GHz at 3 m		± 4.5 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2: 2011.
The measurement uncertainty is given with a confidence of 95 %.

6.5 Test results, 30 – 1000 MHz, Class B, AC/DC adapter



Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m distance.

Measurement results, Quasi Peak, Class B

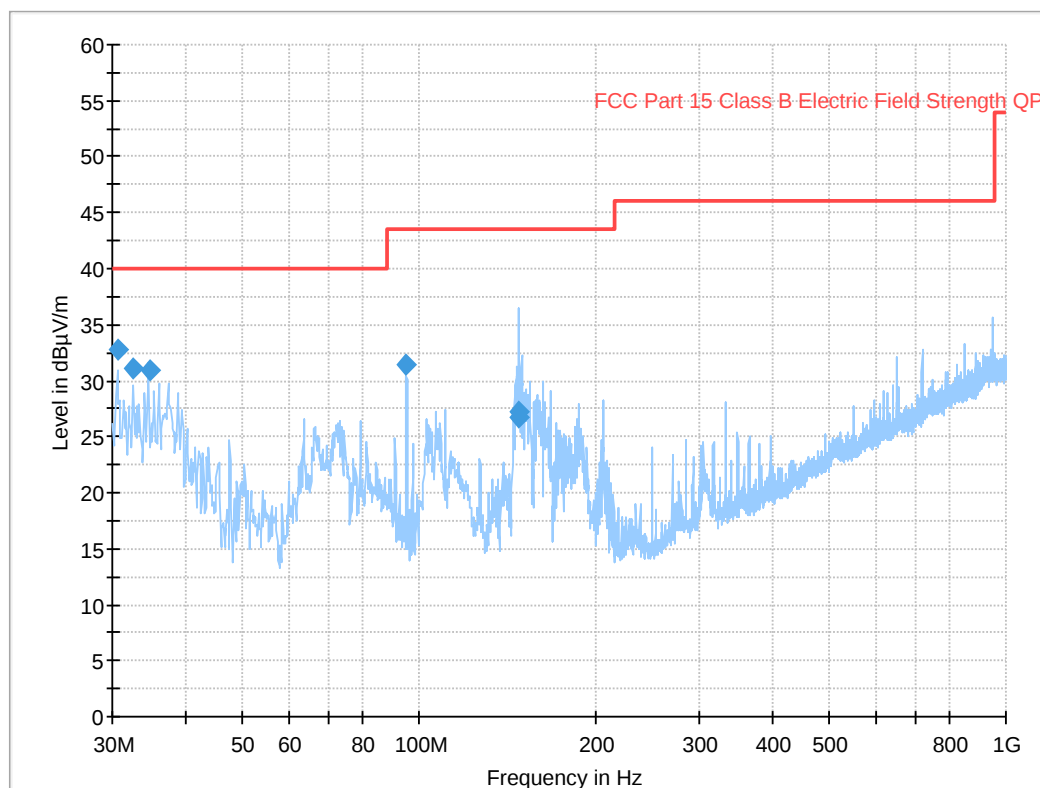
Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
39.060	16.1	29.5	V	13.5
102.873	16.0	33.0	V	17.0
103.950	17.2	33.0	V	15.8
148.056	14.8	33.0	V	18.2
249.998	26.2	35.5	V	10.3
949.975	26.3	35.5	V	10.2

All other measured disturbances have a margin of more than 20 dB to the limits.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6.6 Test results, 30 – 1000 MHz, Class B, PoE

Full Spectrum



Diagram, Peak overview sweep, 30 – 1000 MHz at 3 m distance with PoE.

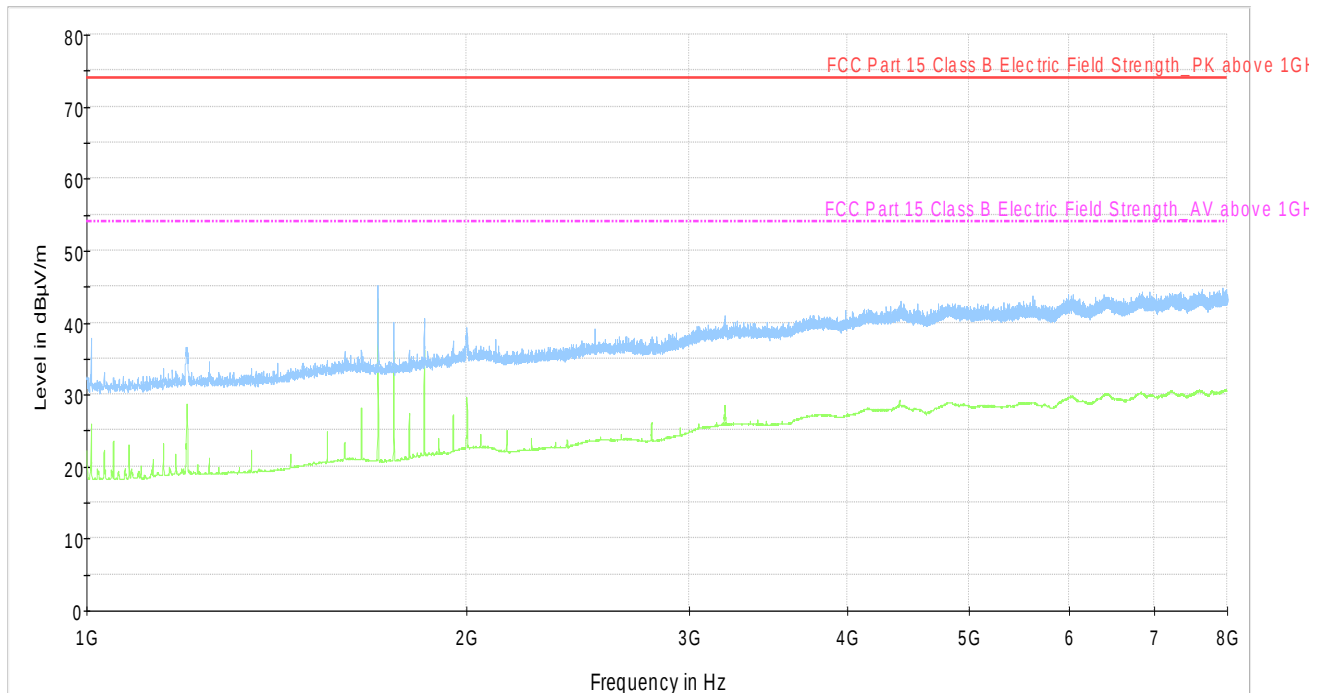
Measurement results, Quasi Peak, Class B

Frequency [MHz]	Level [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
30.620	32.8	40.0	V	7.2
32.605	31.1	40.0	V	8.9
34.649	31.0	40.0	V	9.0
95.230	31.4	43.5	V	12.1
147.936	27.1	43.5	H	16.4
148.319	26.7	43.5	H	16.8

All other measured disturbances have a margin of more than 20 dB to the limits.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6.7 Test results, 1 – 6 GHz, Class B



Diagram, Peak and average overview sweep, 1 – 6 GHz at 3 m distance.

Measurement results, Peak, Class B

Frequency [MHz]	Level [dBμV/m]	Limit [dBμV/m]	Polarization H/V	Margin [dB]
1199.4	36.1	74.0	H	37.9
1699.9	43.1	74.0	V	30.9
1749.9	38.6	74.0	V	35.4
1850.0	38.0	74.0	V	36.0
1999.0	35.8	74.0	H	38.2

All measured Peak disturbances are below the average limit 54 dBμV/m. Average values are not measured

PoE option was not measured above 1 GHz because no differences between power options were found above 200 MHz frequencies.

Result [dBμV/m] = Analyser reading [dBμV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6.8 Test equipment

10 m chamber

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 -	--	--	--
Measurement Receiver	Rohde & Schwarz	ESU 8	12866	7/2017	1 year
Antenna	Chase	CBL6111A	971	9/2017	3 years
Preamplifier	Semko	AM-1331	7993	6/2017	1 year
Antenna	Rohde & Schwarz	HF907	31245	12/2016	3 years
Preamplifier	Rohde & Schwarz	BLMA0118	31246	4/2017	1 year

5m chamber

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 -	--	--	--
Measurement Receiver	Rohde & Schwarz	ESI 26	12866	7/2017	1 year
Antenna	Rohde & Schwarz	HL562	32310	6/2017	3 years