





EMC TEST REPORT FCC CFR Title 47 / Chapter I / Subchapter A / Part 15 / Subpart B ISED ICES-003 Issue 7	
Report Reference No	G0M-2306-2109-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	    <p> A2LA - Registration number: 1983.01 (ISED) ISED wireless device testing laboratory: CN 3470A DAkkS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970 </p>
Applicant	Vaisala Oy
Address	Vanha Nurmijärventie 21 01670 Vantaa Finland
Test Specification Standard(s)	FCC CFR Title 47 / Chapter I / Subchapter A / Part 15 / Subpart B ISED ICES-Gen Issue 1 ; Amendment 1 (February 2021) ISED ICES-003 Issue 7 ANSI C63.4:2014+A1:2017
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Ground Check Device RI41
Model(s)	RI41-B
Additional Model(s)	None
Brand Name(s)	None
Hardware Version(s)	D
Software Version(s)	2.05
FCC-ID	2AO39-RI41
IC	23830-RI41
Test Result	PASSED

Possible test case verdicts:		
required by standard but not tested	N/T	
not required by standard	N/R	
required by standard but not appl. to test object	N/A	
test object does meet the requirement	P(PASS)	
test object does not meet the requirement	F(FAIL)	
Testing:		
Date of receipt of test item	2023-09-12	
Report:		
Compiled by	Stephan Liebich	
Tested by (+ signature) (Responsible for Test)	Stephan Liebich	
Approved by (+ signature) (Deputy Head of Lab)	Jens Marquardt	
Date of Issue	2023-11-06	
Total number of pages	35	
General Remarks:		
<p>The test results presented in this report relate only to the object tested.</p> <p>The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.</p> <p>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.</p>		
<p>Statement concerning the uncertainty of the measurement systems used for decisions on conformity (decision rule):</p> <p>The Decision Rule is applied on the basis of CISPR 16-4-2 and/or IEC 61000-4-x (TR 61000-1-6) and their national publications. These standards provide guidance on how to calculate and apply measurement uncertainty whilst providing maximum uncertainties allowance. In all cases due consideration will be given to ILAC-G8:09/2019.</p> <p>Compliance or non-compliance with a disturbance limit is determined in the following manner.</p> <ul style="list-style-type: none"> - If U_{lab} is less than or equal to U_{CISPR}, then: compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit. - If U_{lab} is greater than U_{CISPR}, then: compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{CISPR})$, exceeds the disturbance limit; non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{CISPR})$, exceeds the disturbance limit. <p>Where appropriate for the test, for example for EMC pulsed immunity tests, the laboratory has demonstrated, by calibrating its equipment and facilities, that it complies with the above requirements and therefore no allowance of uncertainties has been given to the tolerances.</p>		
Additional Comments:		
None		

Additional variants have been declared by the manufacturer. The listed models were not tested, evaluated or assessed in no way.		
Additional Model 1	Product Type Description	Ground Check Device RI41
	Model Name	RI41-B
	Brand Name (optional)	None
	Hardware Version	B
	Software Version	2.05
Additional Model 2	Product Type Description	Ground Check Device MWH322
	Model Name	MWH322USB
	Brand Name (optional)	None
	Hardware Version	B
	Software Version	2.05

ABBREVIATIONS AND ACRONYMS

Acronyms	
Acronym	Description
EUT	Equipment Under Test
FCC	Federal Communications Commission
ISED	Innovation, Science and Economic Development Canada
T _{NOM}	Nominal operating temperature
V _{NOM}	Nominal supply voltage

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2023-11-06	Initial Release	--

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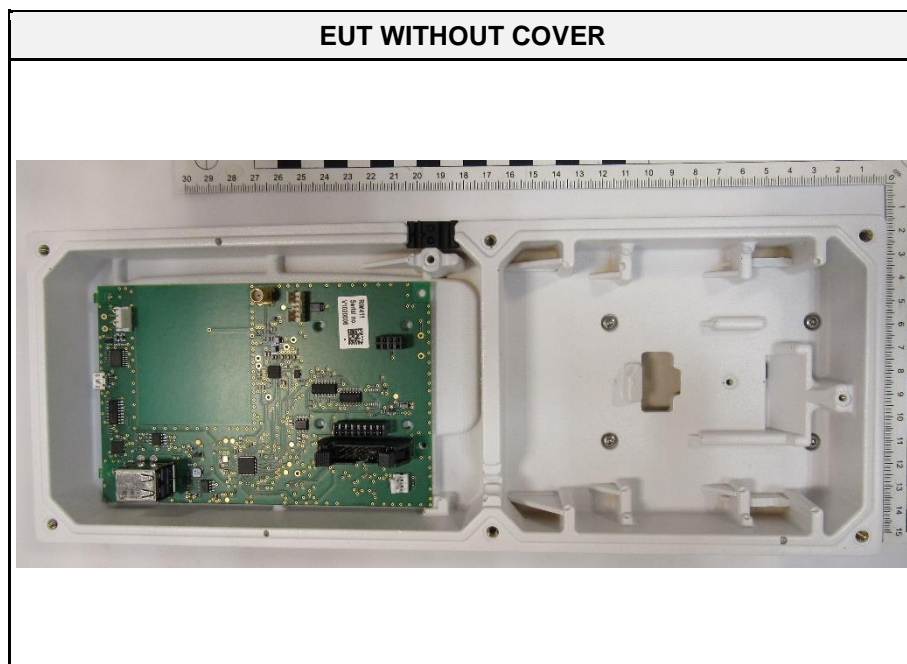
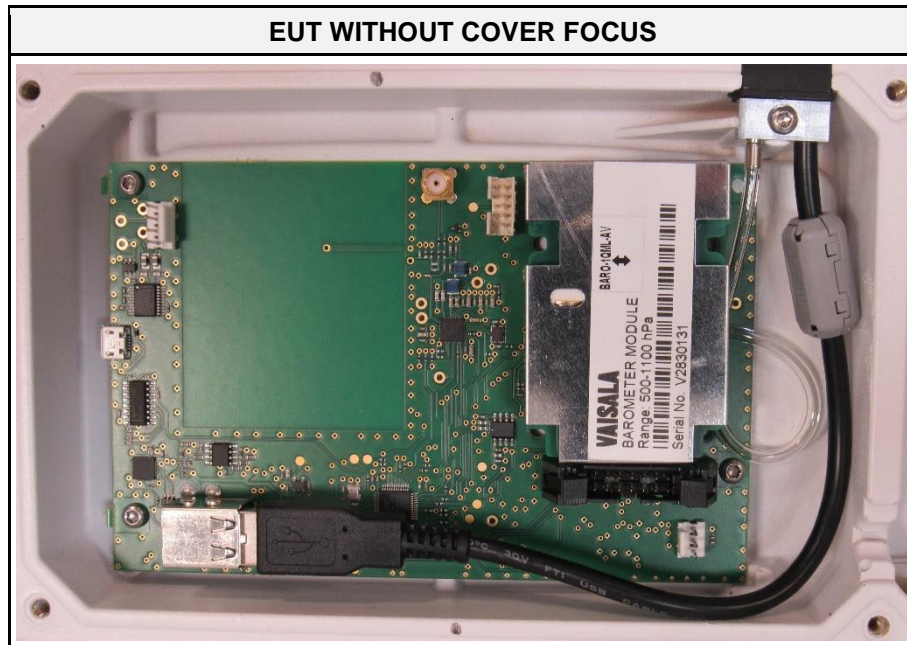
1 Equipment (Test Item) Under Test

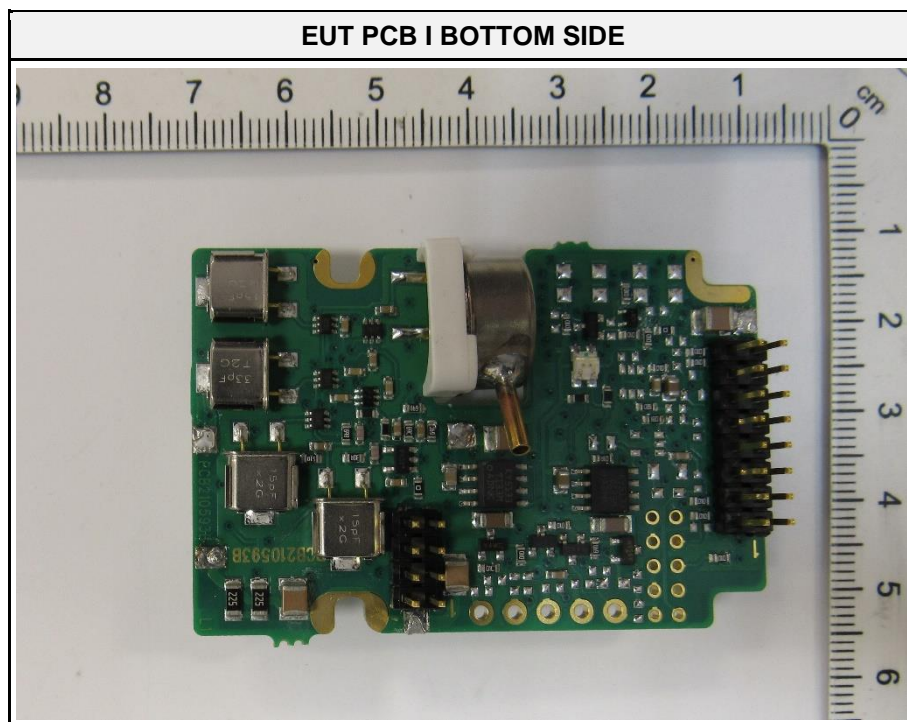
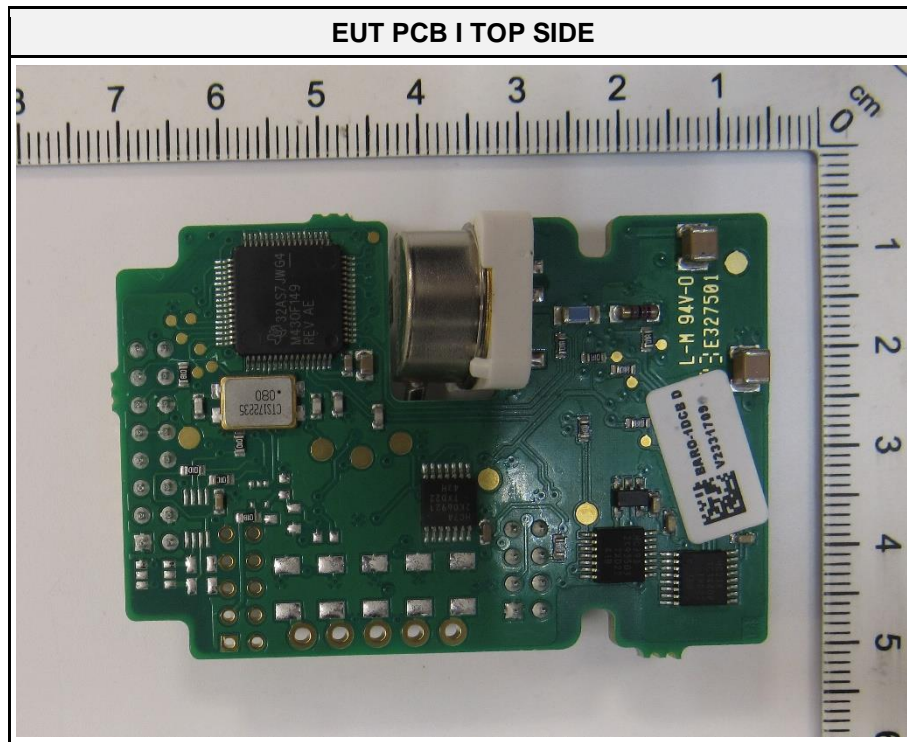
Description	Ground Check Device RI41		
Intended Use	Radiosonde ground check is an essential part of reliable sounding operations. With Ground Check Device RI41, each radiosonde is checked prior to launch to detect possible damages occurred, for example, during transportation, and to guarantee high measurement accuracy of PTU measurements. New GEN4 technologies make this possible in an easy to-use and maintenance-free way.		
Model	RI41		
Additional Model(s)	None		
Brand Name(s)	None		
Hardware Version(s)	D		
Software Version(s)	2.05		
Number of tested samples	1		
Sample Identification	EUT #	Sample-ID	Serial Number
	EUT 1	45532	V1020006
EUT Dimensions [cm]	6.3 x 12.5 x 32.7		
FCC-ID	2AO39-RI41		
IC	23830-RI41		
Class	Class B		
Equipment type	Table top		
Highest internal frequency [MHz]	24		
Protective Earth	No		
Functional Earth	No		
Radio Module	None		
Supply Voltage	V _{NOM}	5.00 V DC via USB connection	
	V _{MIN}	4.75 V DC via USB connection	
	V _{MAX}	5.25 V DC via USB connection	
AC/DC-Adaptor	None		
Manufacturer	Vaisala Oy Vanha Nurmijärventie 21 01670 Vantaa Finland		
Factory	Vaisala Oyj Vanha Nurmijärventie 21 01670 Vantaa Finland		

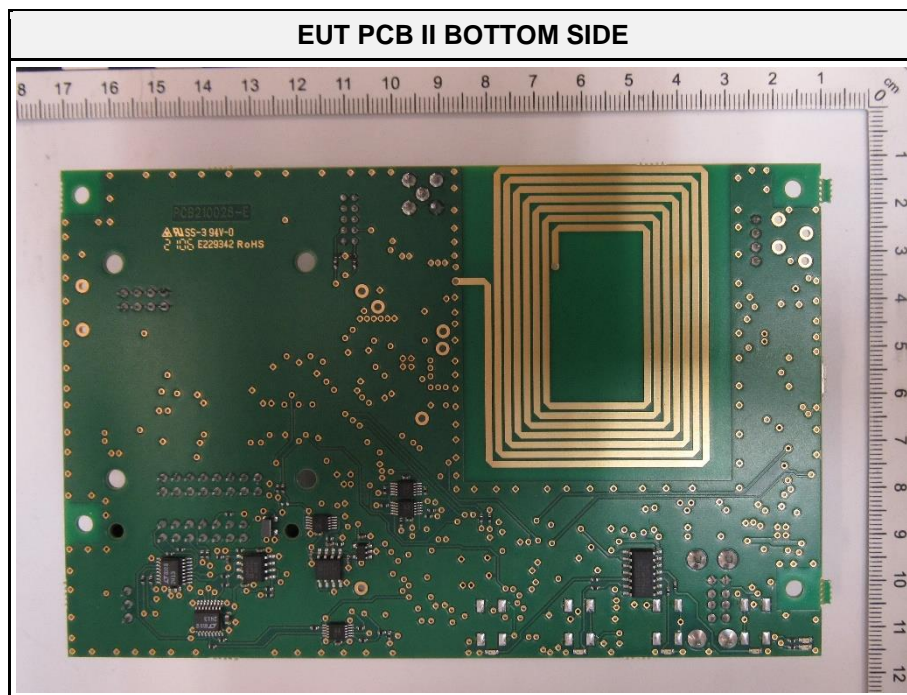
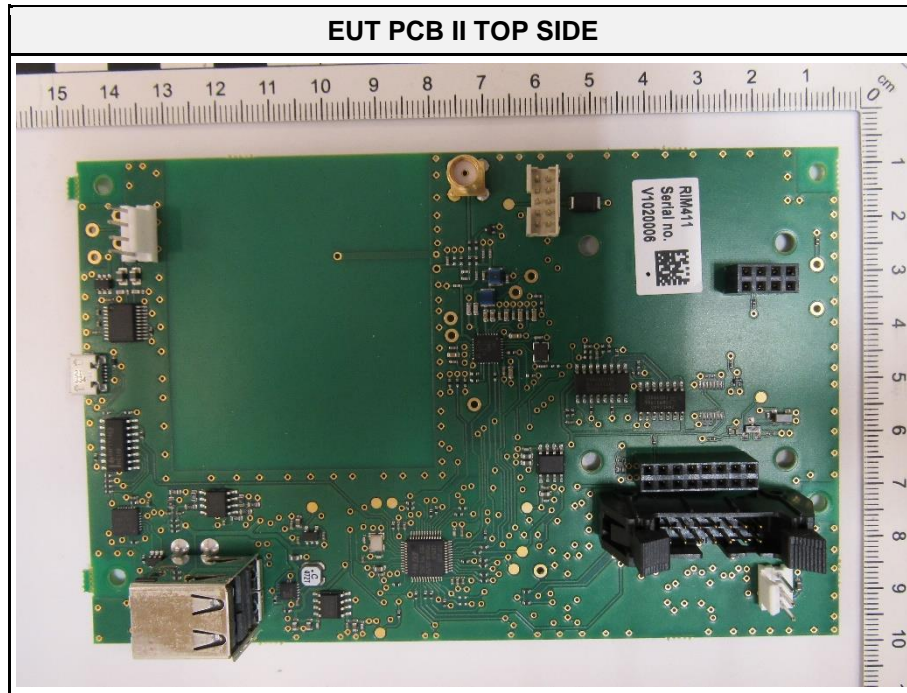
1.1 Equipment Ports

Name	Type	Attributes	Comment
USB	DC	Count: 1 Cable length [m]: 2 Direction: IO Service only: No Shielded: Yes	Powering and communication
Description:			
DC	DC power input/output port		
IO	Input/Output port		

1.2 Equipment Photos - Internal







1.3 Equipment Photos - External



EUT FRONT SIDE



EUT REAR SIDE



EUT RIGHT SIDE



EUT LEFT SIDE



EUT TOP SIDE



EUT BOTTOM SIDE



EUT LABEL

VAISALA
GROUND CHECK DEVICE RI41-B
Voltage 4.75 - 5.25 V ---
Current 300 mA

Pressure 500... 1100hPa

Serial no. V1020006

Made in Finland 2023

Vaisala Oyj, Vanha Nurmijärventie 21, FI-01670 Vantaa, Finland

EUT LABEL DRAFT

VAISALA
GROUND CHECK DEVICE RI41
Model: RI41
Operating voltage 4.75–5.25 V --- 300 mA

Pressure 500–1100 hPa

FCC 2AO39-RI41
IC 23830-RI41

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference,
and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAN ICES3(B) / NMB3(B)
**UK address: Vaisala Ltd, 6230 Bishops Court,
Birmingham B37 7YB**
Made in Finland, 10/2023
**Vaisala Oyj, Vanha Nurmijärventie 21,
FI-01670 Vantaa, Finland**
Serial No.
X1234567


EUT WITH ALL ACCESSORIES



1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Radiosonde	Vaisala	RS41	--
AE	Laptop	Lenovo	ThinkPad T490s	OS: Windows 10 pro; S/N: PC05HRRV AC/DC adapter: (8SSA10M13945L1 CZ85F0697)
SW	Monitoring software	Vaisala	Radiosonde Test UI	Version 1.1.8420 revision 27373
Description:				
AE	Auxiliary Equipment			
SW	Software			
Comment: --				

1.5 Operational Modes

Mode #	Description
1	EUT is continuously reading data from the connected radiosonde via RFID connection (13.56 MHz, max. power). EUT send status data permanently to Laptop via USB connection
Comment: --	

1.6 EUT Configuration

Configuration #	Description
1	EUT is connected to the Laptop via USB connection and powered over the USB port. Laptop is powered over internal battery. Radiosonde is turned on and placed in the holder.
2	EUT is connected to the Laptop via USB connection and powered over the USB port. Laptop is powered over the AC/DC adapter. AC/DC adapter is powered via external laboratory power supply unit. Radiosonde is turned on and placed in the holder.
Comment: --	

1.7 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyser in dBµV. Any external preamplifiers used are taken into account through internal analyser settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyser. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

$$\text{Reading on Analyser (dB}\mu\text{V)} + \text{A.F. (dB/m)} = \text{Net field strength (dB}\mu\text{V/m)}$$

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

$$\text{Limit (dB}\mu\text{V/m)} = 20 \cdot \log(\mu\text{V/m})$$

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

Reading + AF	= Net Reading	:	Net reading - FCC limit	= Margin
+21.5 dBµV + 26 dB/m	= 47.5 dBµV/m	:	47.5 dBµV/m - 57.0 dBµV/m	= -9.5 dB

2 Result Summary

Title 47 CFR Part 15B, ISED ICES-003 Issue 7				
Reference	Requirement	Reference Method	Result	Remarks
Emission				
FCC 15.109 ICES-003, 3.2.2	Radiated emissions	ANSI C63.4:2014 +A1:2017	PASS	--
FCC 15.107 ICES-003, 3.2.1	AC power line conducted emissions	ANSI C63.4:2014 +A1:2017	PASS	--
Comment: --				

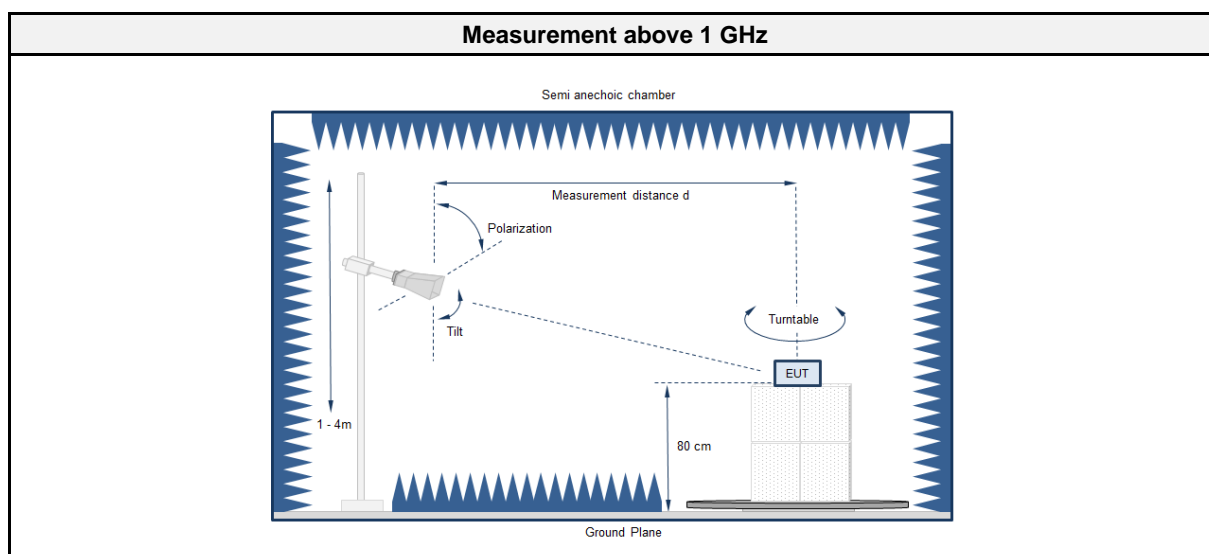
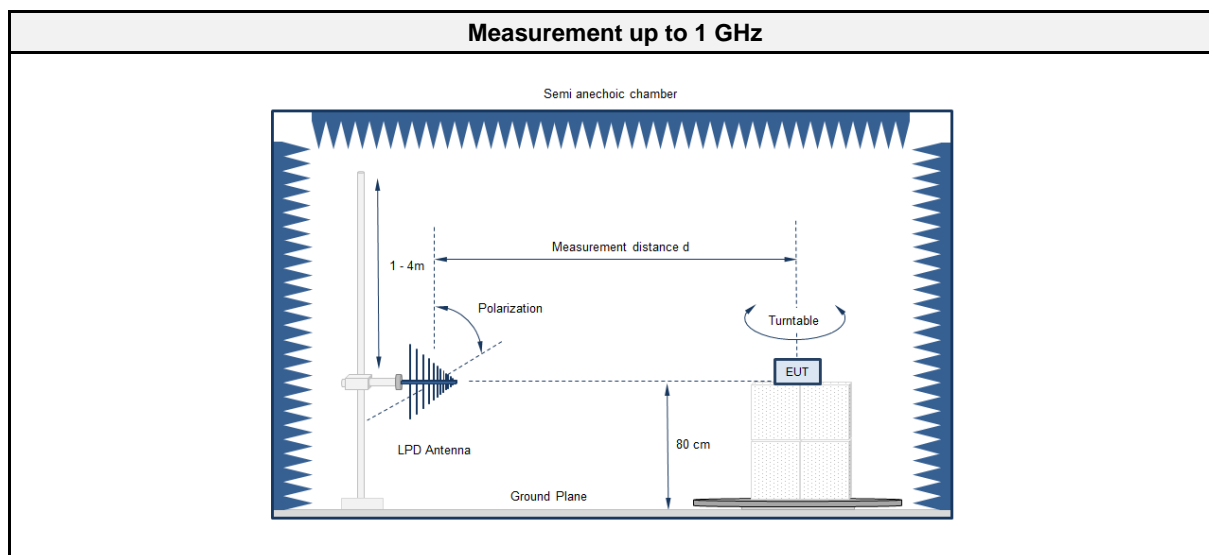
Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

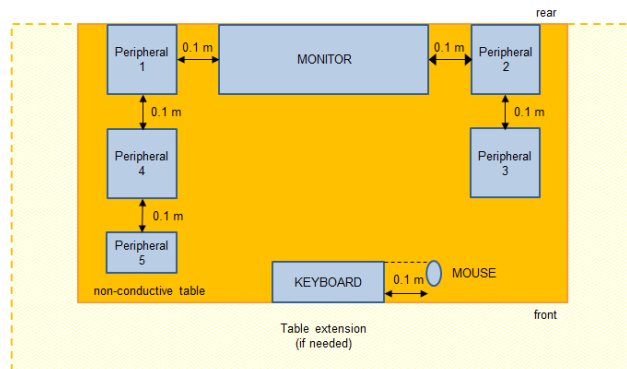
2.1.1 Information

Test Information	
Reference	FCC 15.109, ICES-003, 3.2.2
Reference method	ANSI C63.4 Section 8
Equipment class	Class B
Equipment type	Table top
Highest internal frequency [MHz]	24
Measurement range	30 MHz to 1000 MHz
Temperature [°C]	20 – 25
Humidity [%]	40 – 50
Operator	Pawel Skotnicki
Supervisor	Stephan Liebich
Date	2023-09-15
EUT #	1

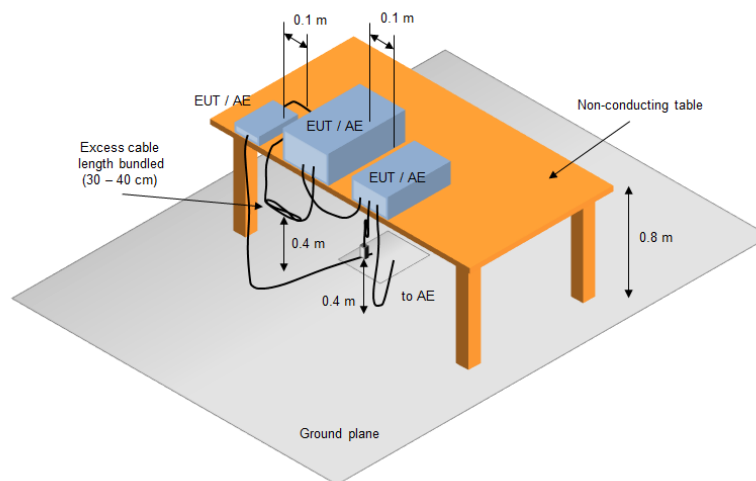
2.1.2 Setup Table top:



Equipment placement - Table top



Test Setup



2.1.3 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	Radimation	2020.1.8

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber (NSA)	Frankonia	AC1	EF00062	2022-11	2025-11
Anechoic chamber (SVSWR)	Frankonia	AC 1	EF01011	2022-11	2023-11
EMI Test Receiver	Keysight	N9038A-526/WXP	EF01070	2023-02	2024-02
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	EF01824	2022-10	2023-10
Climatic Sensor	Embedded Data Systems, LLC.	280010000025417E	EF01054	2023-07	2024-07

2.1.4 Procedure

Exploratory measurement Table top	
1.	The EUT was placed on a non-conductive table at a height of 0.8 m.
2.	The EUT and support equipment, if needed, were set up to simulate typical usage.
3.	Cables, of type and length specified by the manufacturer, were connected to at least one port of each type and were terminated by a device or simulating load of actual usage.
4.	The antenna was placed at a distance of 3 m.
5.	The received signal was monitored at the measurement receiver.
6.	This procedure has to be performed in both antenna polarizations, horizontal and vertical.
7.	The arrangement of the equipment with the maximum emission level is shown on the setup picture at item 2.1.2

Final measurement 3 m Table top	
1.	The EUT was placed on a 0.8 m non-conductive table at a 3 m distance from the receive antenna. The antenna output was connected to the measurement receiver.
2.	A broadband hybrid antenna was used for the frequency range 30 MHz to 1000 MHz. Above one 1 GHz a Double Ridged Broadband Horn antenna was used. The antenna was placed on an adjustable height antenna mast.
3.	The EUT and cable arrangement were based on the exploratory measurement results.
4.	Emissions were maximized at each frequency by rotating the EUT and adjusting the receive antenna height and polarization. The maximum values were recorded.
5.	The test data of the worst-case conditions were recorded and shown on the next pages.

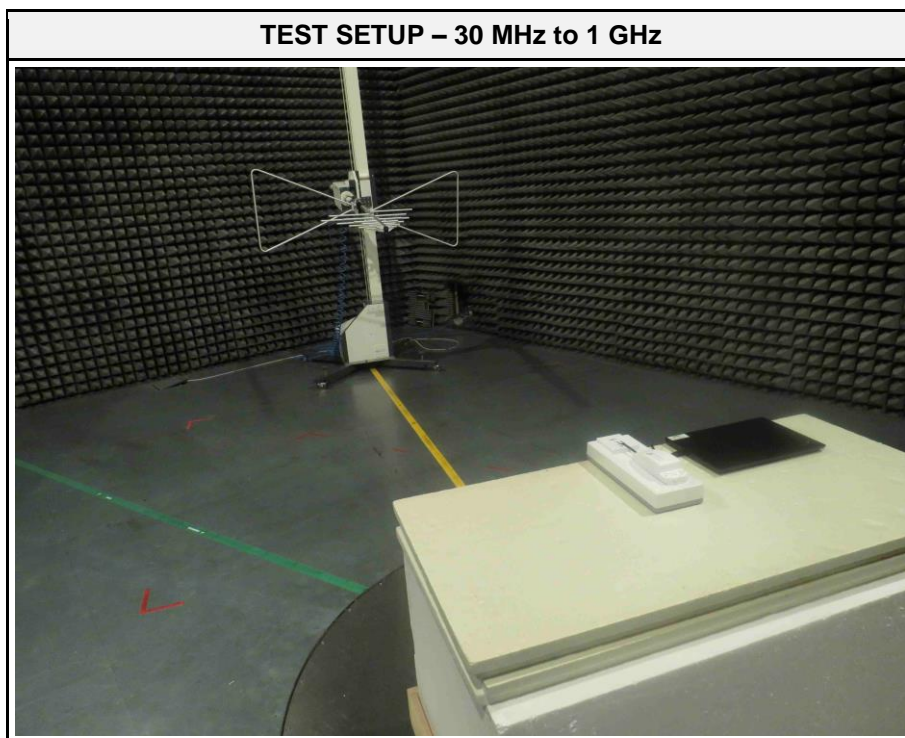
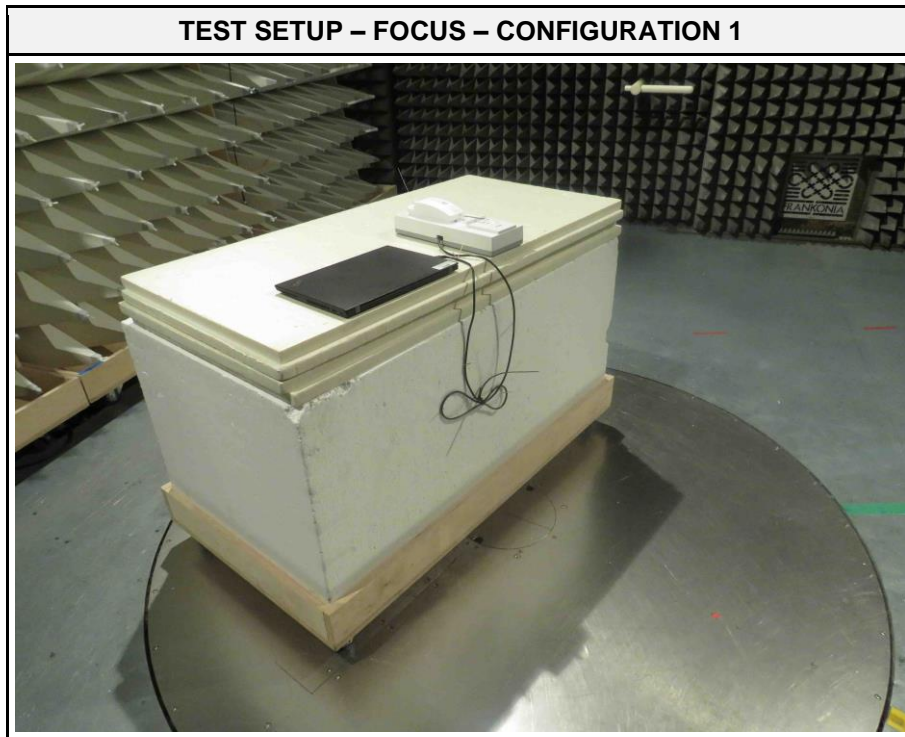
2.1.5 Limits

Class B @ 3 m		
Frequency [MHz]	Detector	Limit [dBμV/m]
30 – 88	Quasi-peak	40
88 – 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46
960 - 1000	Quasi-peak	54
> 1000	Peak	74
	Average	54

2.1.6 Results

Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	--
Note: USB cable length is 2 m.			

2.1.7 Setup Photos



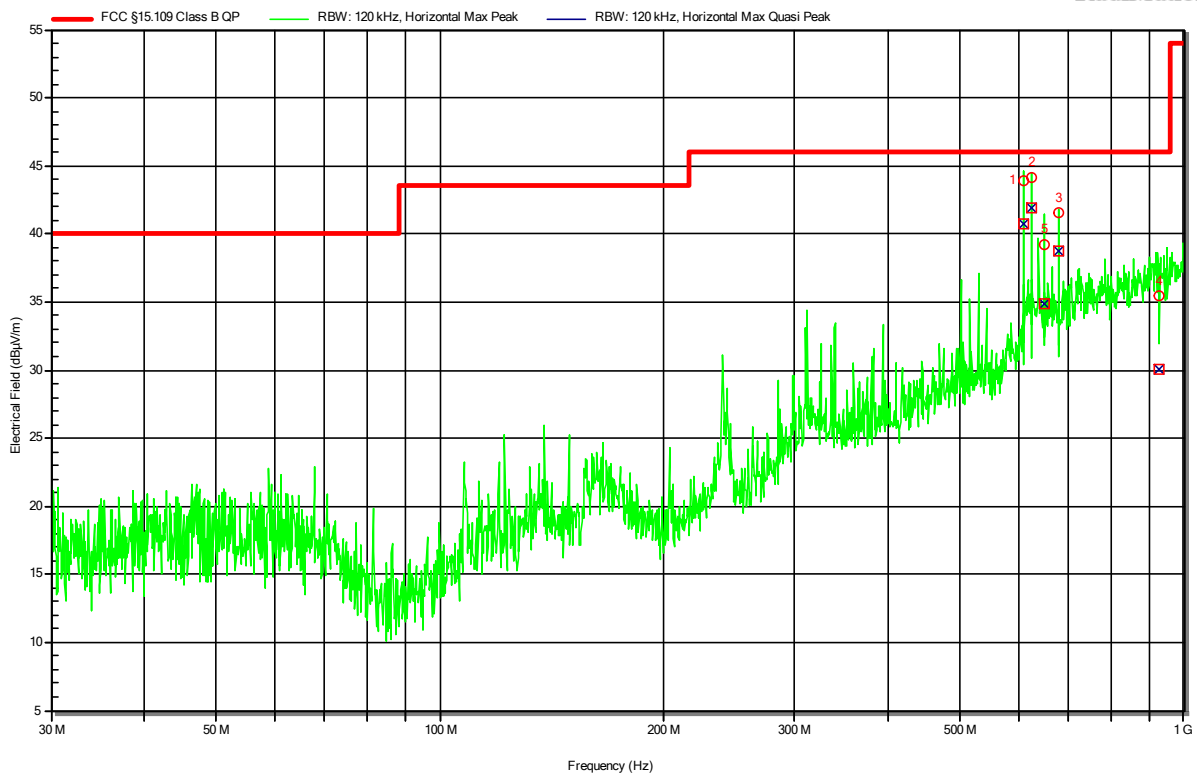
2.1.8 Records

**Radiated emissions
according to FCC part 15B**

Project Number: G0M-2306-2109
 Applicant: Vaisala Oyj
 Model Description: Ground Check Device RI41
 Model: RI41-B
 Test Sample ID: 45532
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Skotnicki
 Test Date: 2023-09-15
 Operating Conditions: ambient temperature: 24 °C
 power input: 5 V DC (USB)
 Antenna: Schwarzbeck VULB 9168, Horizontal
 Measurement Distance: 3 m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1: --

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RadiMation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	610.212 MHz	40.74 dBμV/m	46.02 dBμV/m	-5.29 dB	Pass	110 degrees	1.4 m
2	623.766 MHz	41.96 dBμV/m	46.02 dBμV/m	-4.06 dB	Pass	110 degrees	1.4 m
3	678.011 MHz	38.74 dBμV/m	46.02 dBμV/m	-7.28 dB	Pass	110 degrees	1.4 m
4	927.467 MHz	30.1 dBμV/m	46.02 dBμV/m	-15.92 dB	Pass	110 degrees	1.4 m
5	650.831 MHz	34.87 dBμV/m	46.02 dBμV/m	-11.15 dB	Pass	110 degrees	1.4 m

Test Report No.: G0M-2306-2109-EF0115B-V01

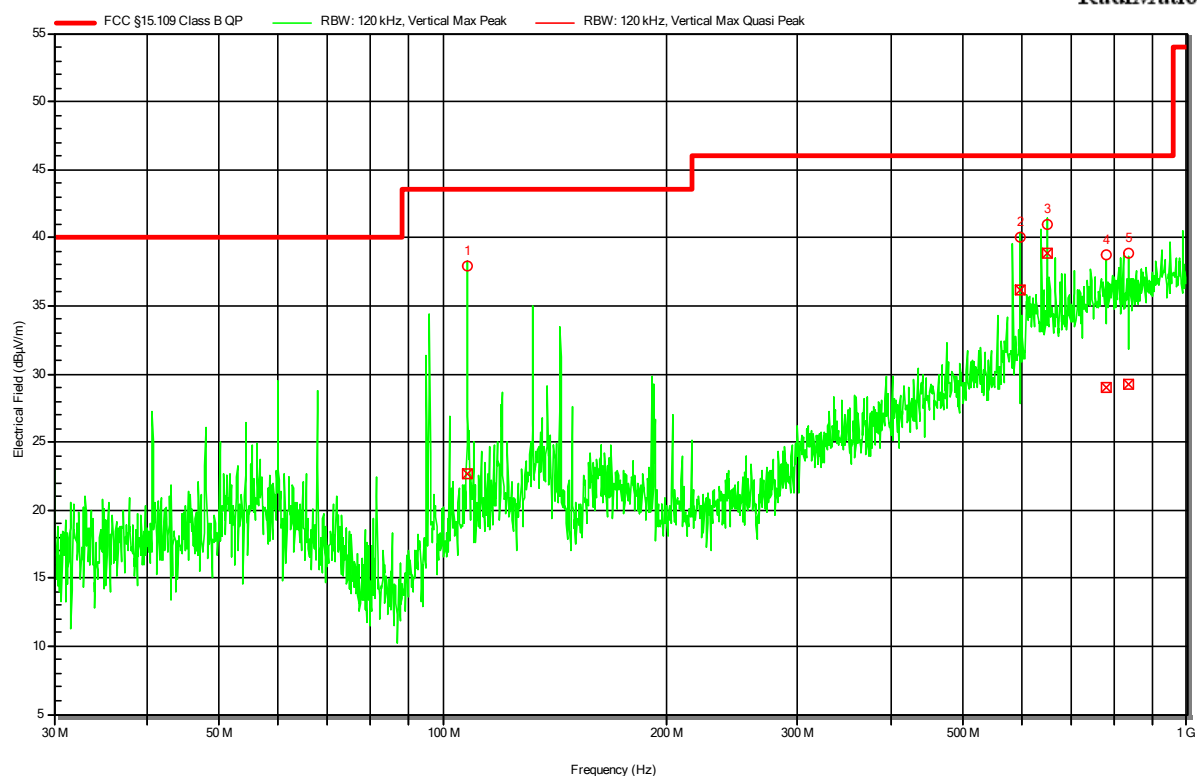
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2306-2109
Applicant: Vaisala Oyj
Model Description: Ground Check Device RI41
Model: RI41-B
Test Sample ID: 45532
Test Site: Eurofins Product Service GmbH
Operator: Mr. Skotnicki
Test Date: 2023-09-15
Operating Conditions: ambient temperature: 24 °C
power input: 5 V DC (USB)
Antenna: Schwarzbeck VULB 9168, Vertical
Measurement Distance: 3 m
Operational Mode: 1
EUT Configuration: 1
Note 1: --

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RadiMation



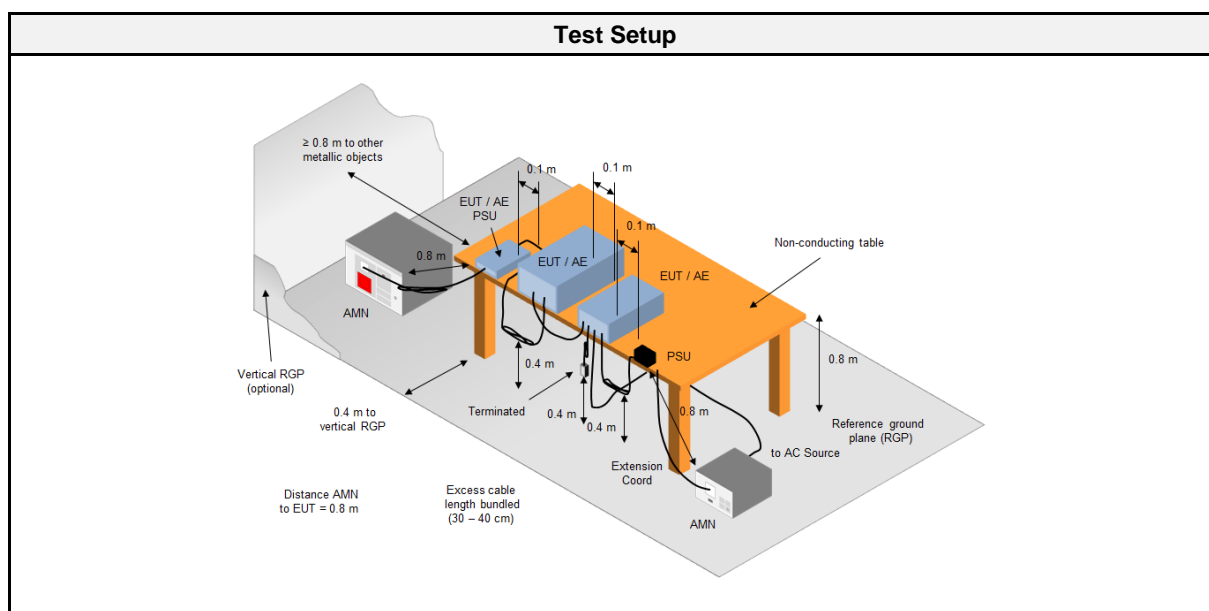
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	107.902 MHz	22.65 dBμV/m	43.52 dBμV/m	-20.87 dB	Pass	-120 degrees	1 m
2	596.646 MHz	36.11 dBμV/m	46.02 dBμV/m	-9.91 dB	Pass	-120 degrees	1 m
3	650.891 MHz	38.87 dBμV/m	46.02 dBμV/m	-7.15 dB	Pass	-120 degrees	1 m
4	781.125 MHz	28.97 dBμV/m	46.02 dBμV/m	-17.05 dB	Pass	-120 degrees	1 m
5	836.503 MHz	29.26 dBμV/m	46.02 dBμV/m	-16.77 dB	Pass	-120 degrees	1 m

Test Report No.: G0M-2306-2109-EF0115B-V01

Eurofins Product Service GmbH
Storkower Str. 38c, D-15526 Reichenwalde, Germany

2.2.1 Information

2.2.2 Setup *Table top*



2.2.3 Equipment

Test Software			
Description	Manufacturer	Name	Version
EMC Software	DARE Instruments	Radimation	2020.1.8

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
AMN	Schwarzbeck	NSLK 8127	EF01592	2023-06	2024-06
Pulse Limiter	R&S	ESH3-Z2	EF01063	2023-08	2025-08
EMI Test Receiver	R&S	ESR 7	EF00943	2023-08	2024-08
Climatic Sensor	Embedded Data Systems, LLC.	2800100000254 17E	EF01054	2023-07	2024-07

2.2.4 Procedure

Exploratory measurement Table top	
1.	The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1)
2.	The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
3.	The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
4.	The LISN measurement port was connected to a measurement receiver
5.	I/O cables were bundled not longer than 0.4 m
6.	Measurement was performed in the frequency range 150 kHz – 30 MHz on each current-carrying conductor
7.	To maximize the emissions the cable positions were manipulated
8.	The worst configuration of EUT and cables is shown on a test setup picture at item 2.2.2

Final measurement Table Top	
1.	The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1)
2.	The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN.
3.	The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length).
4.	The LISN measurement port was connected to a measurement receiver
5.	The EUT and cable arrangement were based on the exploratory measurement results
6.	The test data of the worst-case conditions were recorded and shown on the next pages

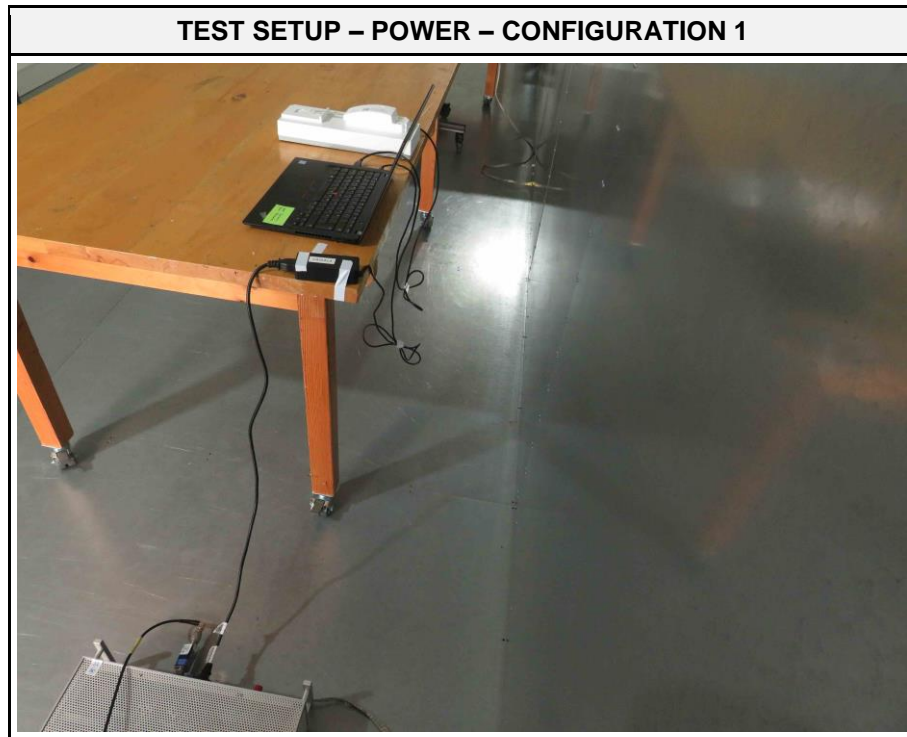
2.2.5 Limits

Class B		
Frequency [MHz]	Quasi-peak Limit [dBμV]	Average Limit [dBμV]
0.15 - 0.5	66 - 56 *	56 - 46 *
0.5 - 5	56	46
5 - 30	60	50
* Decreases with the logarithm of the frequency		

2.2.6 Results

AC power line conducted emissions					
Port	Coupling	Operational mode	EUT Configuration	Verdict	Remark
Power	AMN	1	2	PASS	120 V AC / 60 Hz
Note: Power cable length cable is 1 m, all other cable lengths see support equipment table.					

2.2.7 Setup Photos



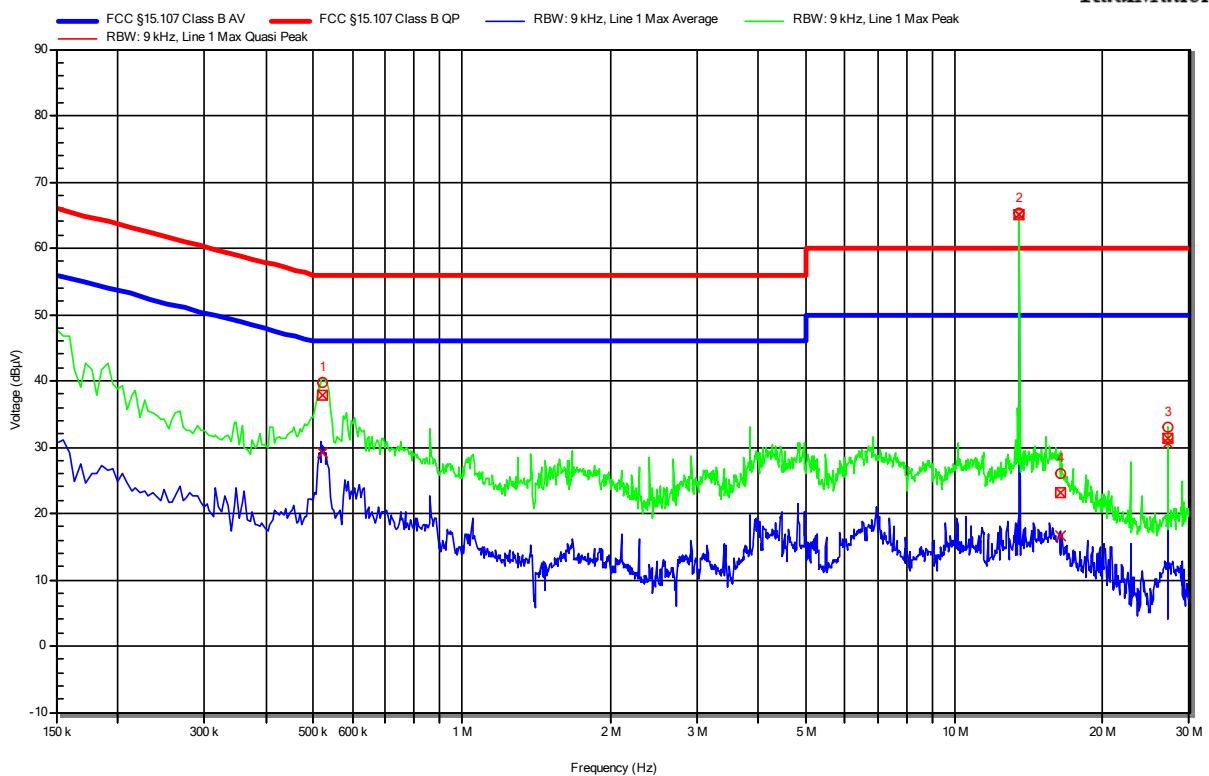
2.2.8 Records

Conducted emissions at the mains power port according to FCC part 15B

Project Number: G0M-2306-2109
 Applicant: Vaisala Oyj
 Model Description: Ground Check Device RI41
 Model: RI41-B
 Test Sample ID: 45532
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Skotnicki
 Test Date: 2023-09-14
 Operating Conditions: ambient temperature: 24 °C
 power input: 120 V AC / 60 Hz
 LISN: Schwarzbeck NSLK 8127
 Operational Mode: 1
 EUT Configuration: 2
 Applied to Port: Power
 Note 1: --

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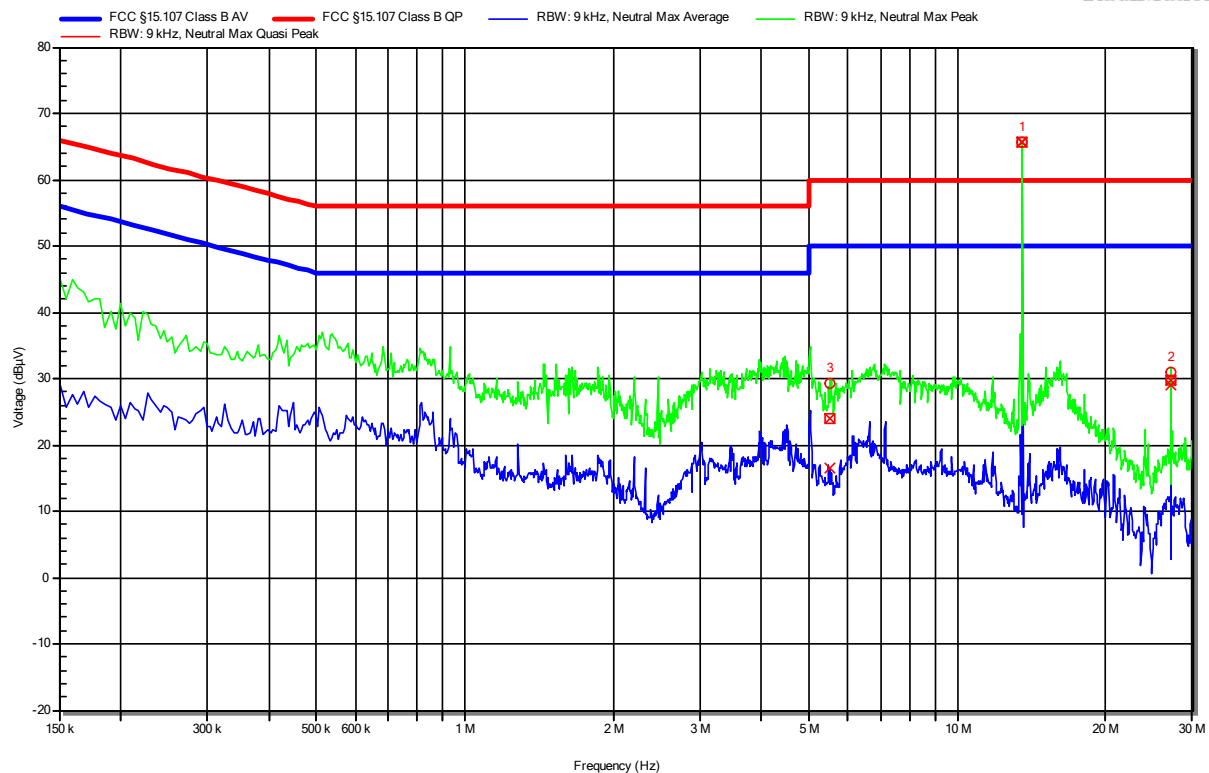
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	519.9 kHz	37.78 dBµV	56 dBµV	-18.22 dB	Pass	Line 1
2	13.56 MHz	SRD carrier				Line 1
3	27.12 MHz	31.29 dBµV	60 dBµV	-28.71 dB	Pass	Line 1
4	16.4 MHz	23.08 dBµV	60 dBµV	-36.92 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	519.9 kHz	29.2 dBµV	46 dBµV	-16.8 dB	Pass	Line 1
2	13.56 MHz	SRD carrier				Line 1
3	27.12 MHz	30.49 dBµV	50 dBµV	-19.51 dB	Pass	Line 1
4	16.4 MHz	16.61 dBµV	50 dBµV	-33.39 dB	Pass	Line 1

**Conducted emissions at the mains power port
according to FCC part 15B**

Project Number: G0M-2306-2109
 Applicant: Vaisala Oyj
 Model Description: Ground Check Device RI41
 Model: RI41-B
 Test Sample ID: 45532
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Skotnicki
 Test Date: 2023-09-14
 Operating Conditions: ambient temperature: 24 °C
 power input: 120 V AC / 60 Hz
 LISN: Schwarzbeck NSLK 8127
 Operational Mode: 1
 EUT Configuration: 2
 Applied to Port: Power
 Note 1: --

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Radiation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	13.56 MHz	SRD carrier				Neutral
2	27.123 MHz	29.75 dBμV	60 dBμV	-30.25 dB	Pass	Neutral
3	5.516 MHz	23.98 dBμV	60 dBμV	-36.02 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	13.56 MHz	SRD carrier				Neutral
2	27.123 MHz	28.99 dBμV	50 dBμV	-21.01 dB	Pass	Neutral
3	5.516 MHz	16.45 dBμV	50 dBμV	-33.55 dB	Pass	Neutral

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3 Measurement Uncertainty

All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2.

Test Name	Measurement Uncertainty
Conducted emissions at the mains power port	150 kHz to 30 MHz, 3.35dB
Radiated Emission	30 MHz to 200 MHz @ 3m, 5.1dB 200 MHz to 1G Hz @ 3m, 5.3dB