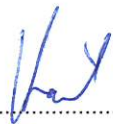


EMC TEST REPORT	
Title 47 CFR Part 15B, ISED ICES-003 Issue 7	
Report Reference No	G0M-2111-1145-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	    A2LA - Registration number: 1983.01 (ISED) ISED wireless device testing laboratory: CN 3470A DAKKS - Registration number : D-PL-12092-01-04 (FCC) FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	Adolf Würth GmbH
Address	Reinhold-Würth-Str. 12-17 74653 Künzelsau-Gaisbach Germany
Test Specification Standard(s)	Title 47 CFR Part 15 Subpart B ISED ICES-003 Issue 7 ANSI C63.4:2014+A1:2017
Non-Standard Test Method	None
Equipment under Test (EUT):	
Product Description	Laser Distance Meter
Model(s)	WDM 6-22
Additional Model(s)	None
Brand Name(s)	Würth
Hardware Version(s)	V09
Software Version(s)	V05
FCC-ID	RFF-LD3BT
IC	3177A-LD3BT
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	2021-11-19	
Report:		
Compiled by	Ruslan Colbasiuc	
Tested by (+ signature) (Responsible for Test)	Ruslan Colbasiuc	
Approved by (+ signature) (EMC Test Technician)	Matthias Handrik	
Date of Issue	2022-01-31	
Total number of pages	35	
General Remarks:		
The test results presented in this report relate only to the object tested. 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. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.		
Additional Comments:		

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	2022-01-31	Initial Release	-

REPORT INDEX

1	Equipment (Test Item) Under Test.....	6
1.1	Equipment Ports.....	7
1.2	Equipment Photos - Internal.....	8
1.3	Equipment Photos - External.....	13
1.4	Support Equipment.....	21
1.5	Operational Modes.....	22
1.6	EUT Configuration.....	23
1.7	Sample emission level calculation.....	24
2	Result Summary.....	25
2.1	Test Conditions and Results - Radiated emissions acc. to ANSI C63.4.....	26
3	Measurement Uncertainty	35

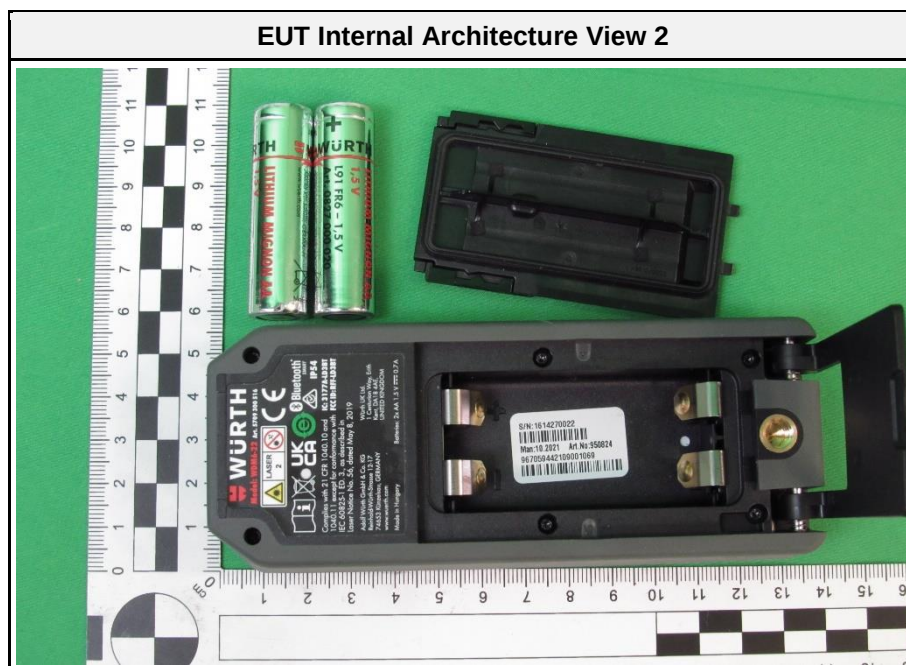
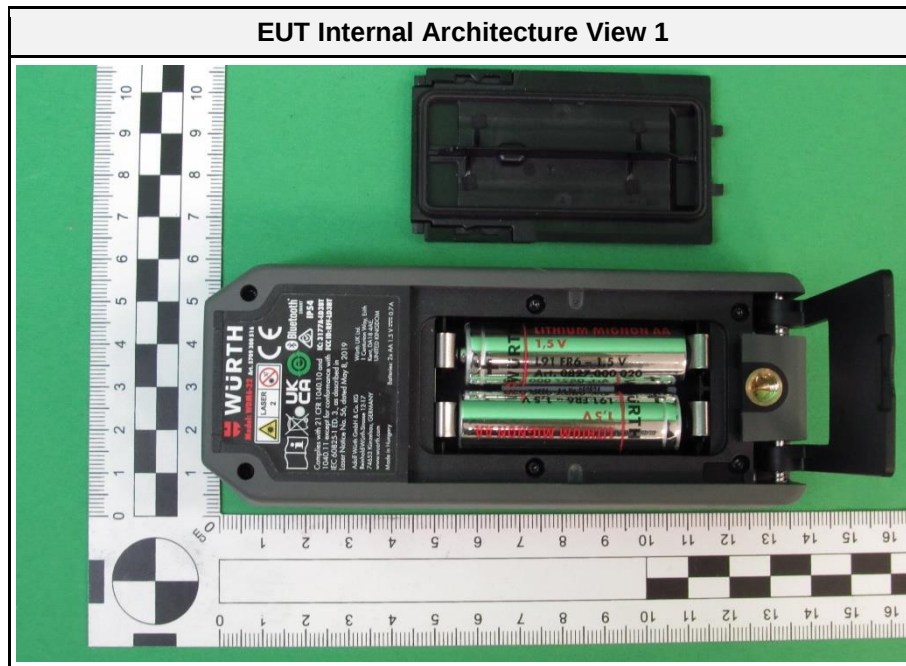
1 Equipment (Test Item) Under Test

Description	Laser Distance Meter	
Model	WDM 6-22	
Additional Model(s)	None	
Brand Name(s)	Würth	
Serial Number(s)	1614270022 (Eurofins ID 37319)	
Hardware Version(s)	V09	
Software Version(s)	V05	
EUT Dimensions [cm]	13.3x2.9x5.5	
FCC-ID	RFF-LD3BT	
IC	3177A-LD3BT	
Class	Class B	
Equipment type	Table top	
Highest internal frequency [MHz]	2480	
Radio Module	Type	Bluetooth LE
	Model	nRF52832-QFAA-R
	Manufacturer	Nordic
	FCC-ID	-
	IC	-
Supply Voltage	V _{NOM}	3 V DC non rechargeable battery
Manufacturer	Leica Geosystems AG Heinrich-Wild-Strasse 9435 Heerbrugg SWITZERLAND	
Factory	flex Munkas u. 28 8660 Tab Ungarn	

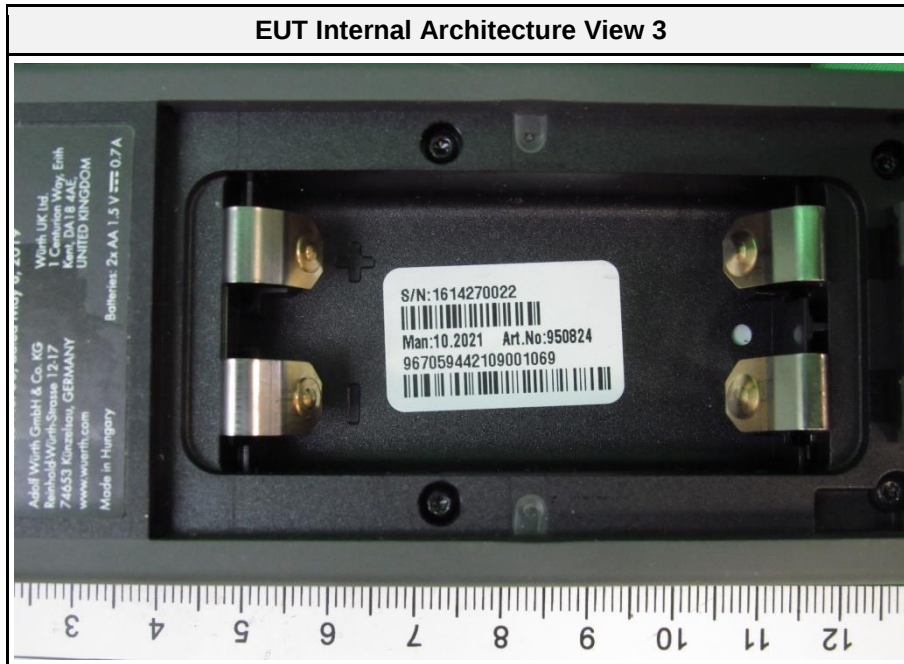
1.1 Equipment Ports

Name	Type	Attributes	Comment
None			
Description:			
AC	AC mains power input/output port		
DC	DC power input/output port		
BAT	DC power input port connected to external battery		
IO	Input/Output port		
TP	Telecommunication port		
NE	Non-electrical port		

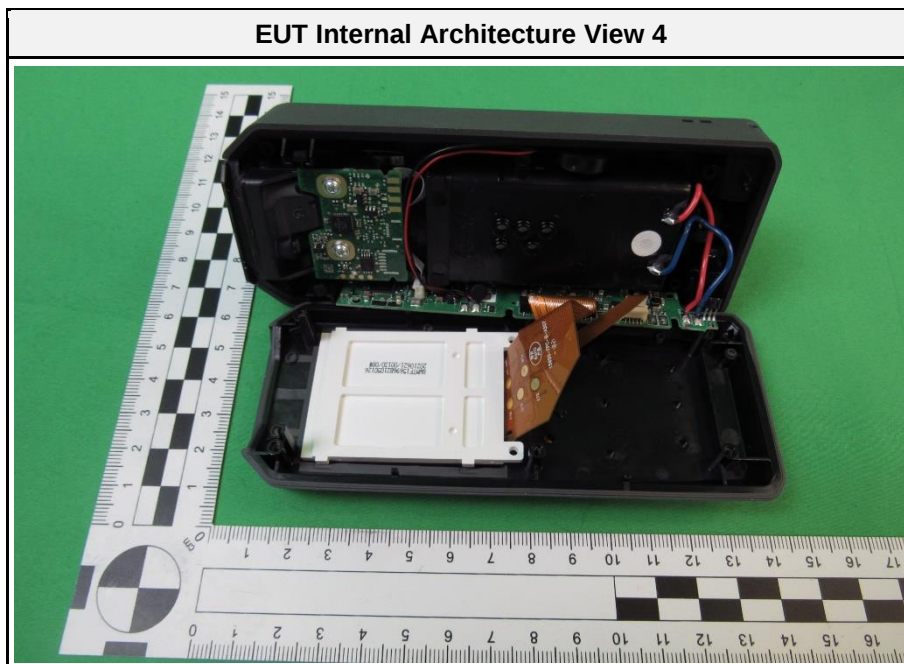
1.2 Equipment Photos - Internal



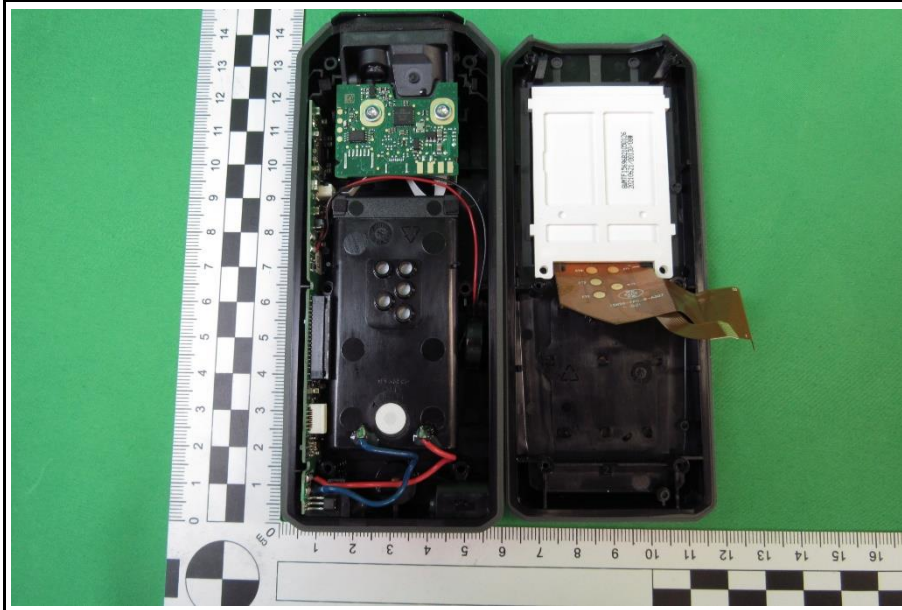
EUT Internal Architecture View 3



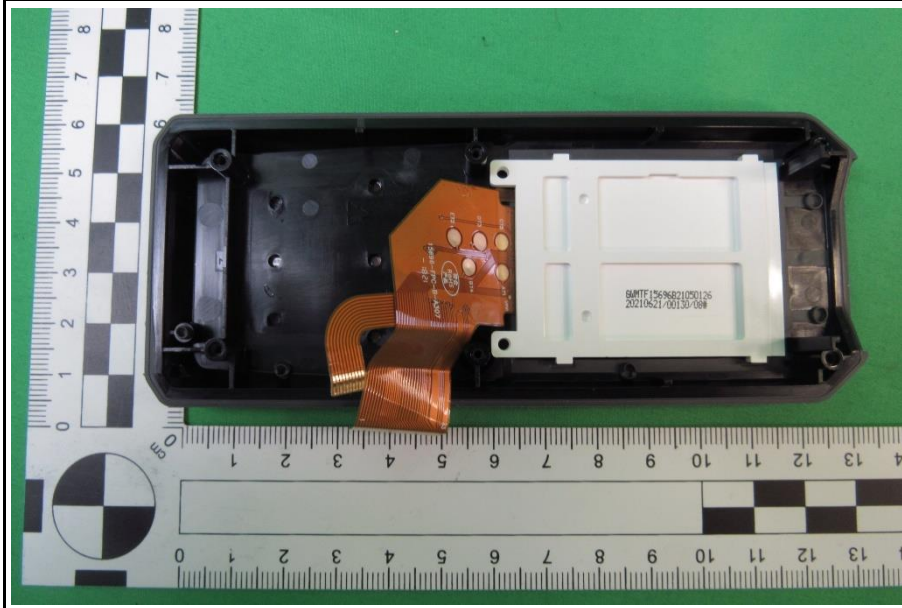
EUT Internal Architecture View 4



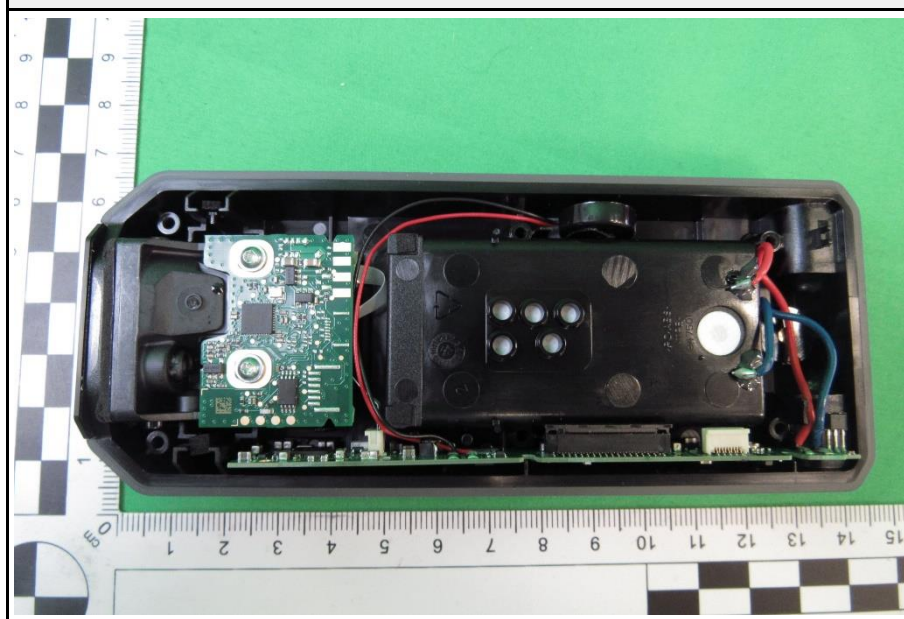
EUT Internal Architecture View 5



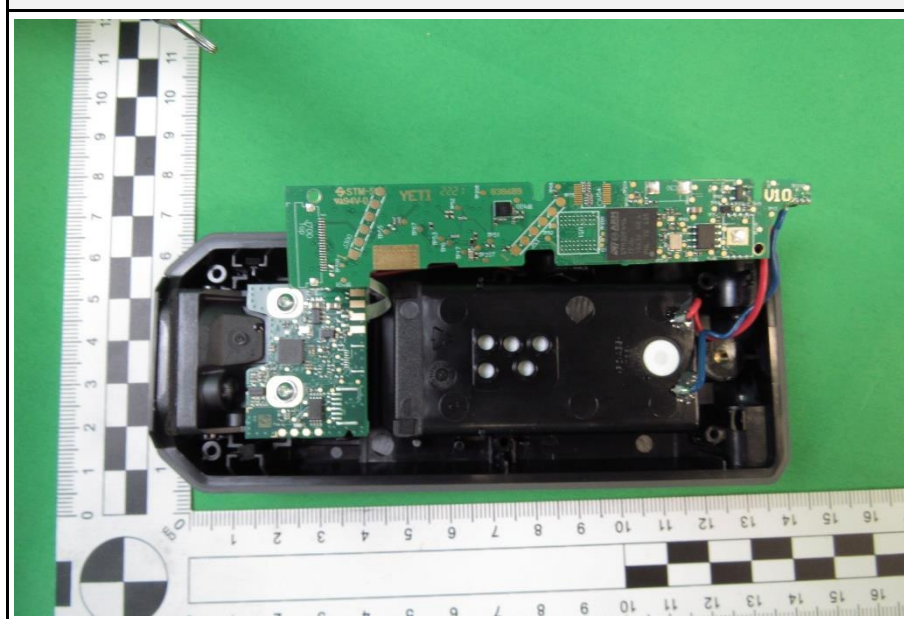
EUT Internal Architecture View 6

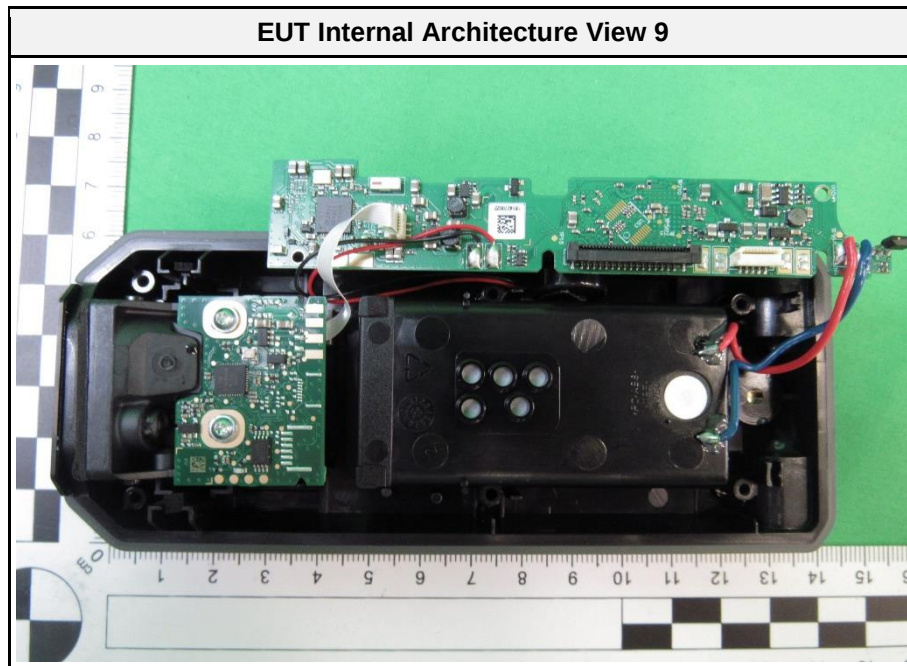


EUT Internal Architecture View 7



EUT Internal Architecture View 8





1.3 Equipment Photos - External



EUT with Transport Bag View 1



EUT Front View



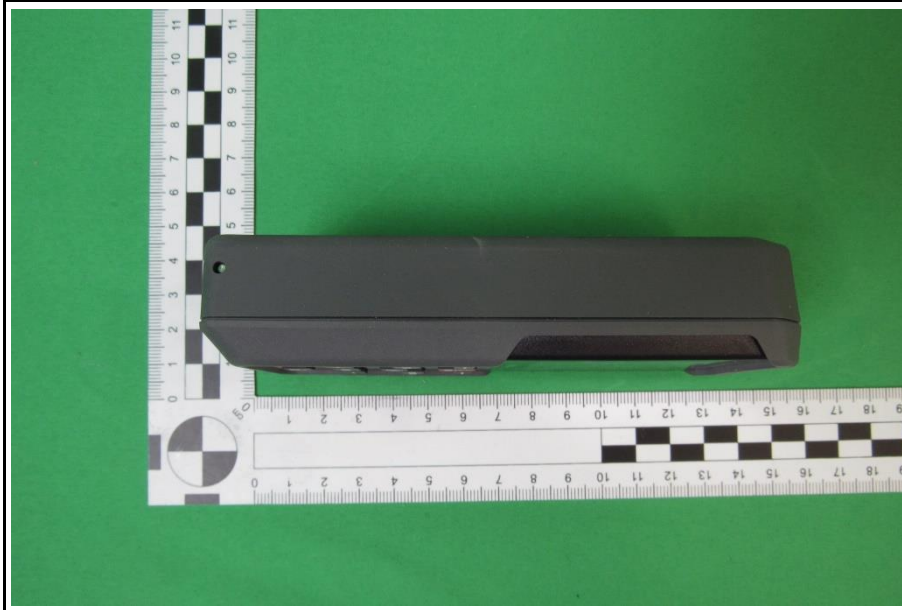
EUT Right Side View



EUT Back View



EUT Left Side View



EUT Bottom View



EUT Top View



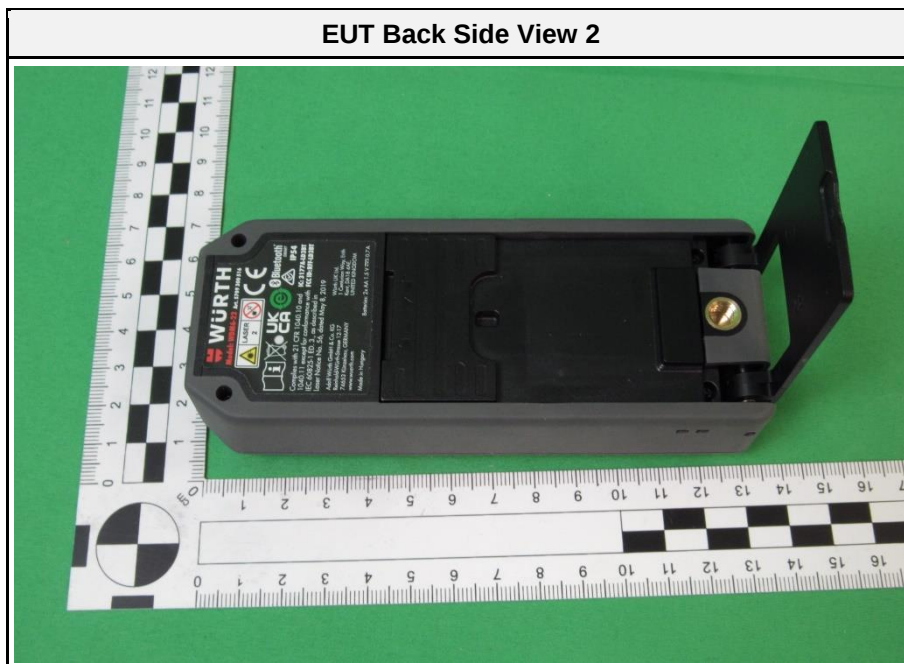
EUT Back Side View with Eurofins ID Label



EUT Label



EUT Back Side View 2



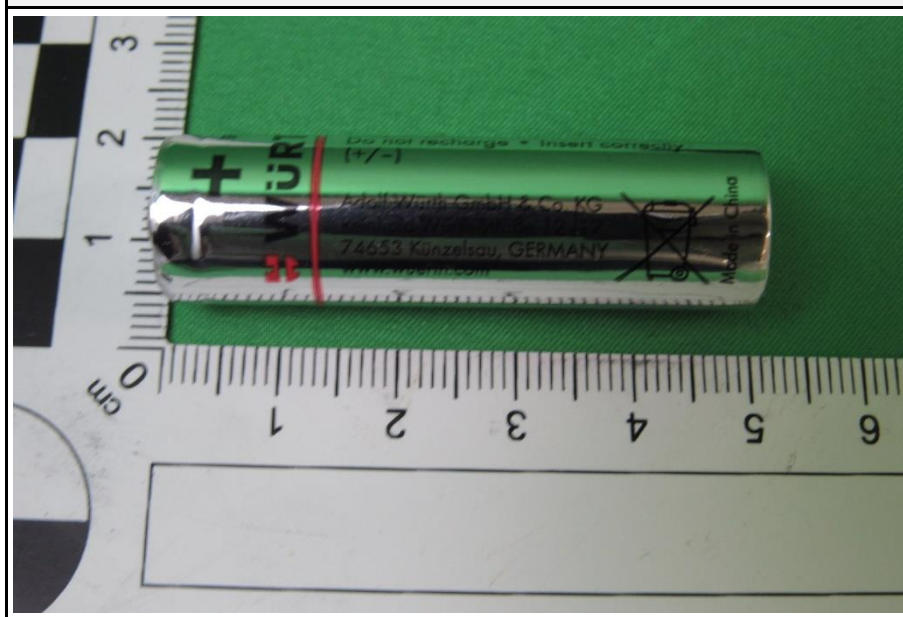
EUT Non Rechargeable Batteries View 1



EUT Non Rechargeable Batteries View 2



EUT Non Rechargeable Batteries View 3



1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Smartphone	Samsung	A71	-
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
Comment:				

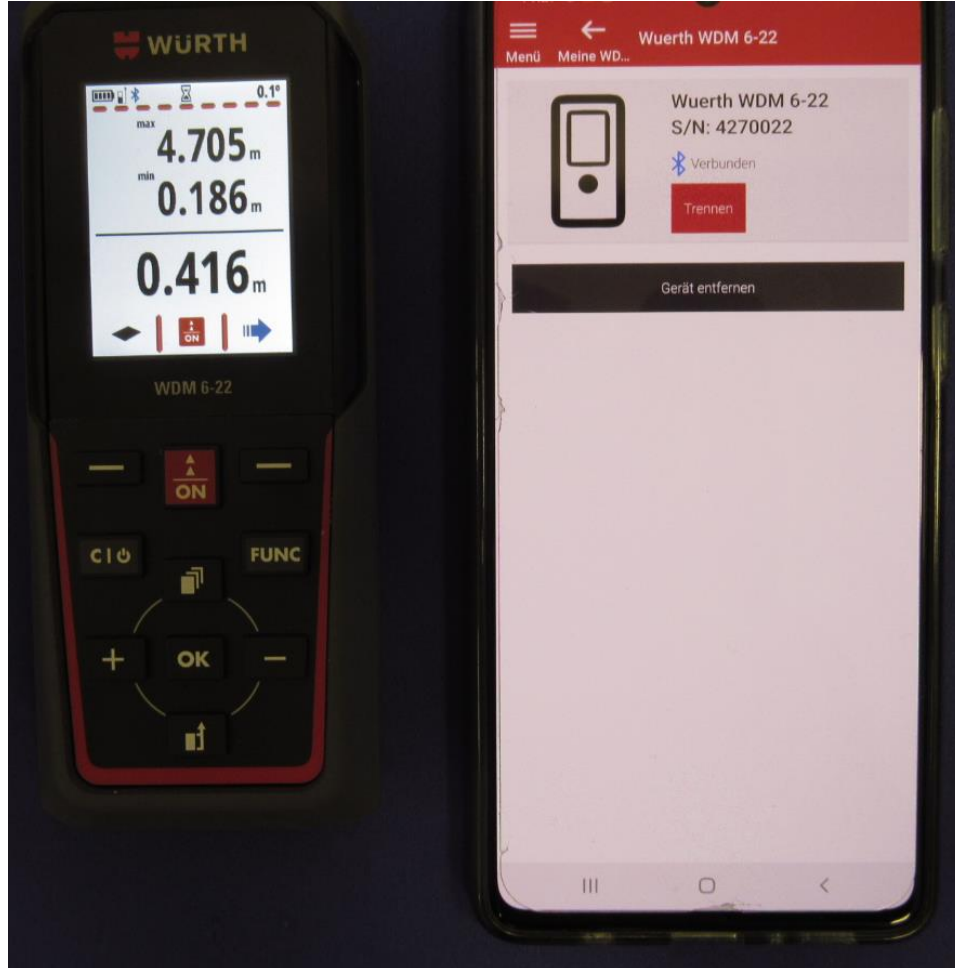
1.5 Operational Modes

Mode #	Description
1	Continuous distance measurement and Bluetooth low energy connection, without active data transfer.
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	EUT powered on and connected with a test smartphone via Bluetooth low energy.

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	N/R	Battery powered device
Comment:				

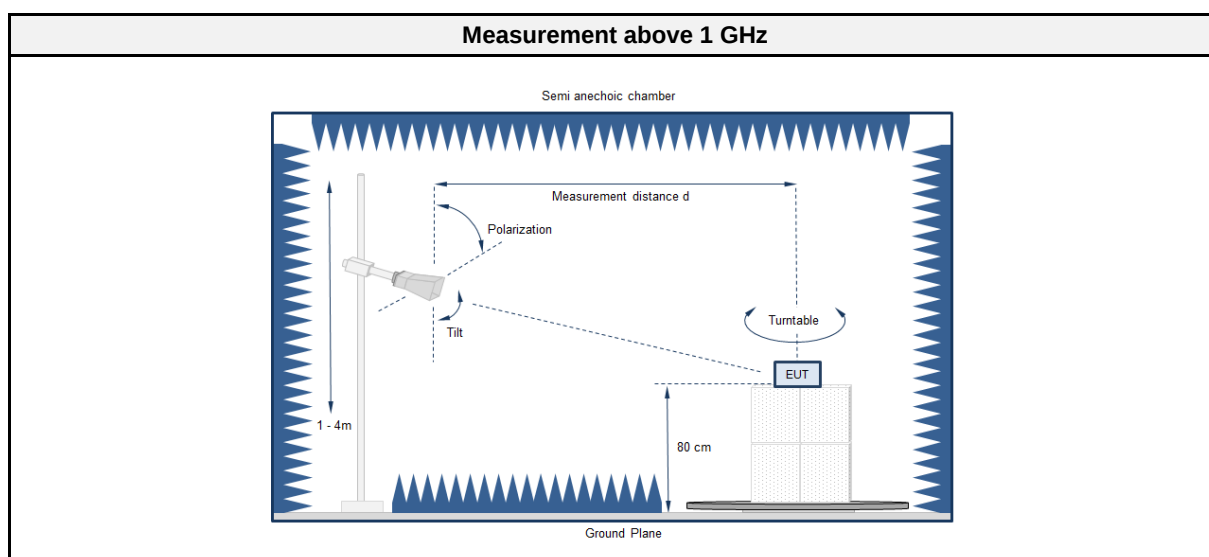
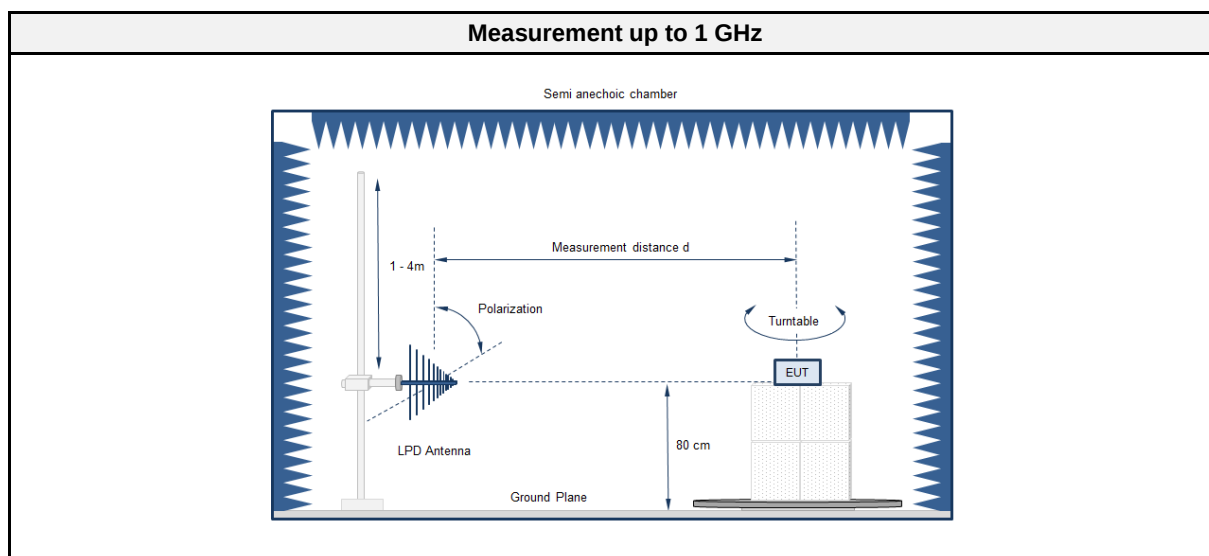
Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

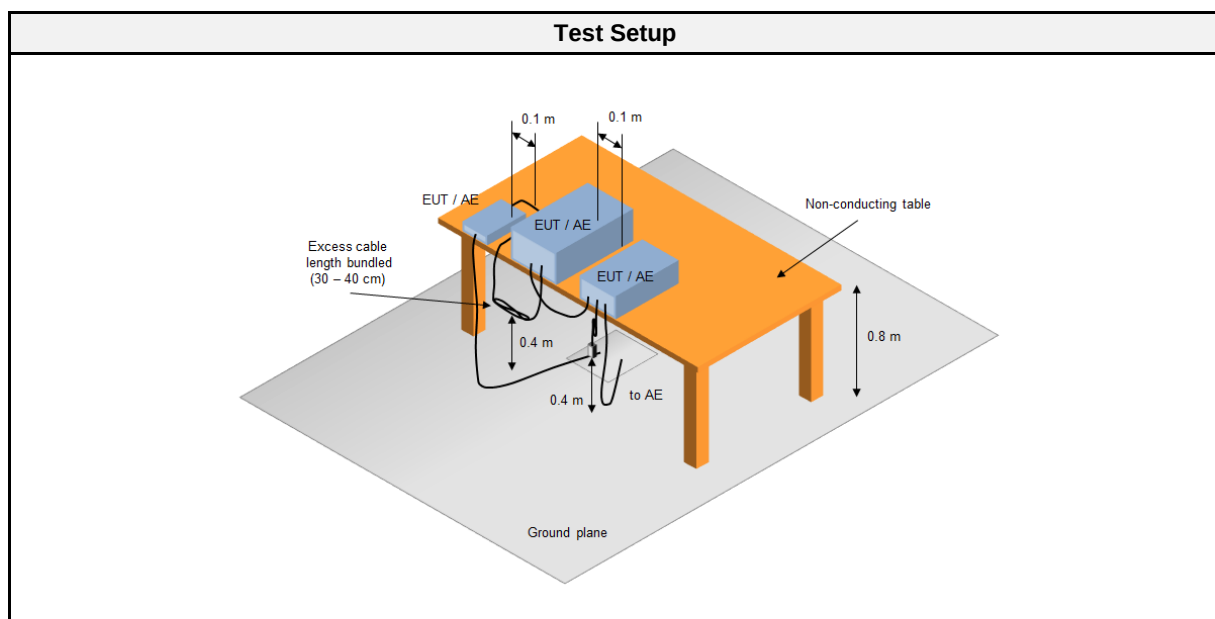
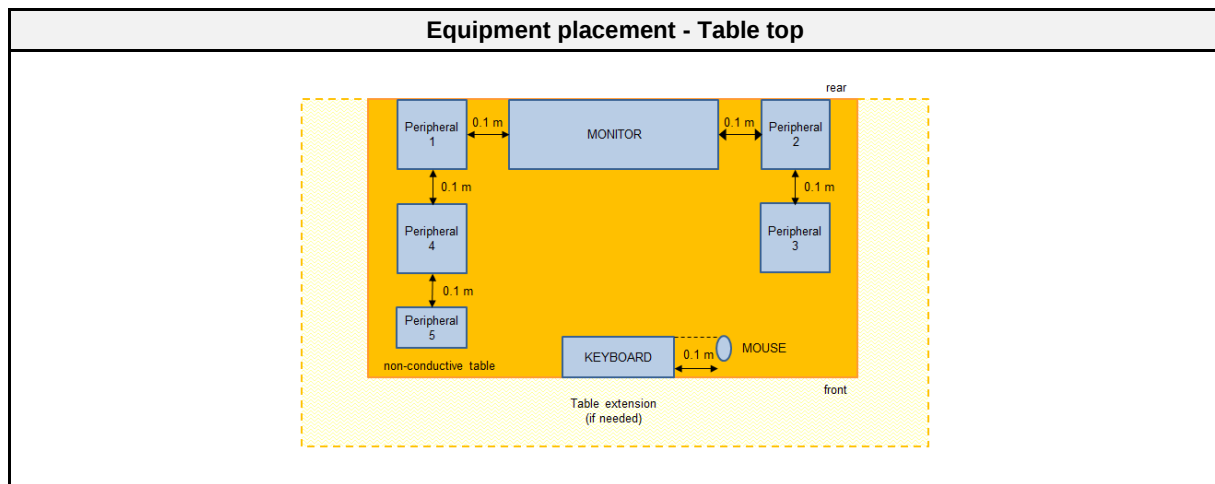
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

2.1.1 Information

Test Information	
Reference	FCC 15.109, ICES-003, 3.2.2
Reference method	ANSI C63.4:2014+A1:2017 Section 8
Equipment class	Class B
Equipment type	Table top
Highest internal frequency [MHz]	2480
Measurement range	30 MHz to 12500 MHz
Temperature [°C]	23
Humidity [%]	40
Operator	Ruslan Colbasiuc
Date	2021-12-23

2.1.2 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	Frankonia	AC6	EF00910	2021-07	2024-07
EMI Test Receiver	R&S	ESU26	EF00887	2021-07	2022-07
TRILOG Broadband Antenna	Schwarzbeck	VULB 9162	EF00978	2019-10	2022-10
Horn Antenna	ETS-Lindgren	3117	EF00976	2019-03	2022-03
Climatic Sensor	Embedded Data Systems, LLC.	9A0010000025477E	EF01124	2021-03	2022-03

2.1.4 Procedure

Exploratory measurement	
1.	The EUT was placed on a non-conductive table at a height of 0.8m.
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 or 10 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	
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 biconical antenna was used for the frequency range 30 – 200 MHz, a logarithmic periodical antenna was used for the frequency range from 200 – 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 [dB μ V/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

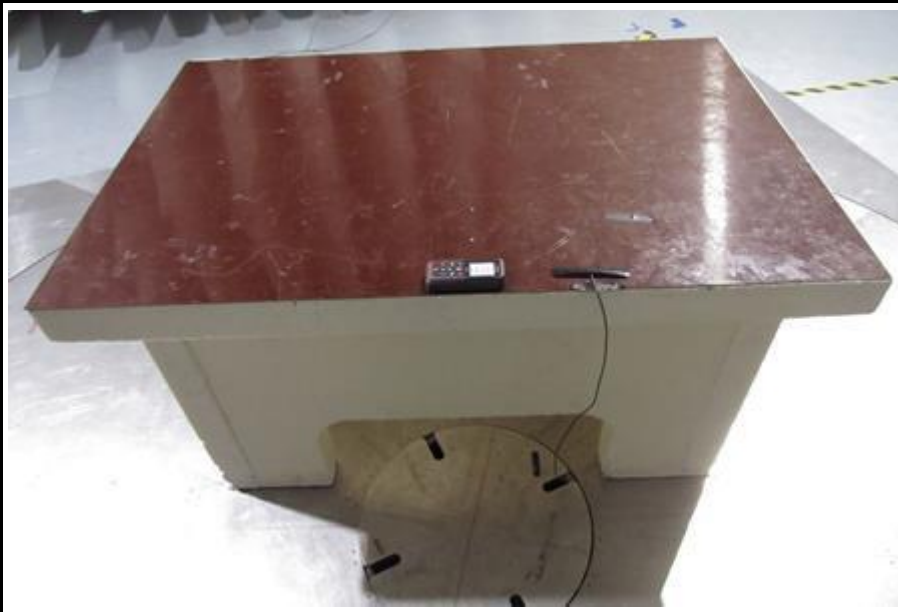
Class A @ 10 m		
Frequency [MHz]	Detector	Limit [dB μ V/m]
30 - 88	Quasi-peak	39
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46.5
960 - 1000	Quasi-peak	49.5
> 1000	Peak	69.5
	Average	49.5

2.1.6 Results

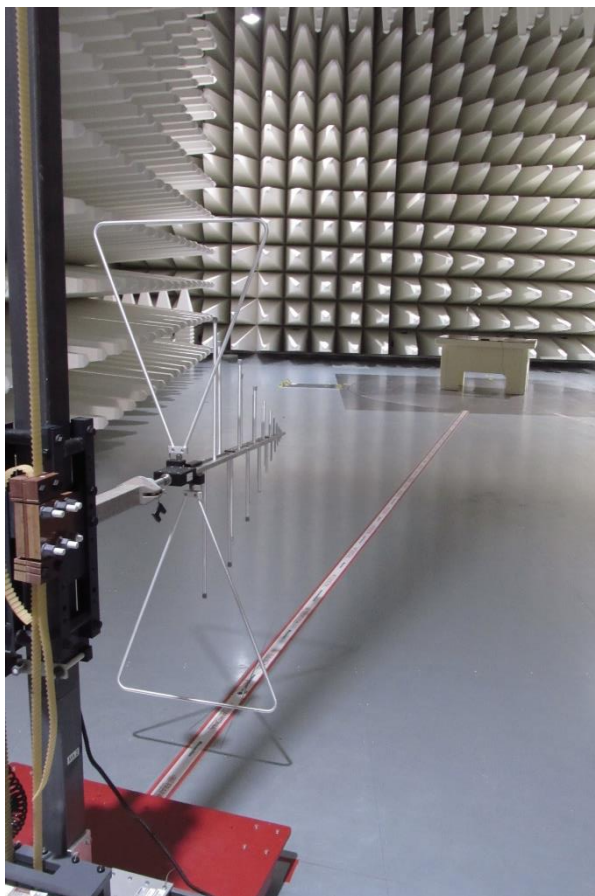
Test Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	-

2.1.7 Setup Photos

Radiated Emission EUT Setup < 1 GHz



Radiated Emission Antenna Setup < 1 GHz



Radiated Emission EUT Setup > 1 GHz



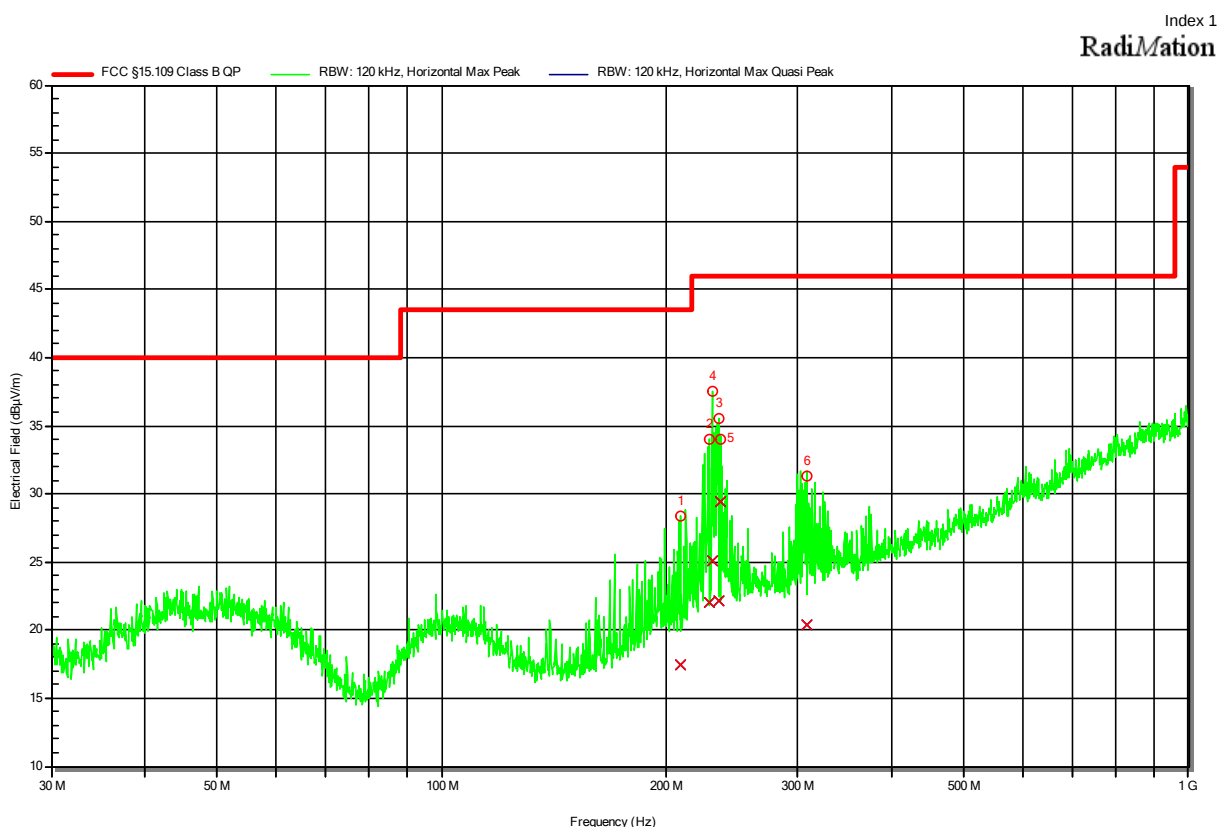
Radiated Emission Antenna Setup > 1 GHz



2.1.8 Records

Radiated emissions according to FCC 15B

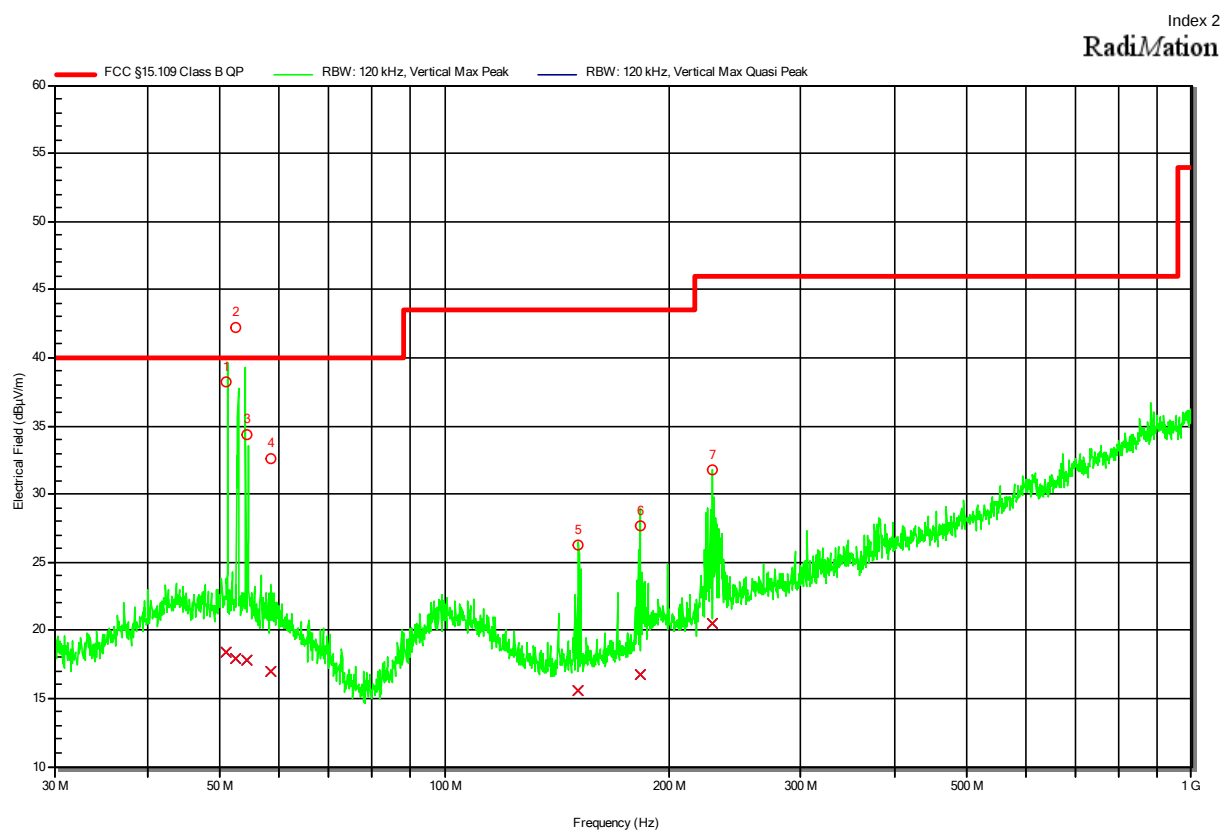
Project Number: G0M-2111-1145
 Applicant: Adolf Würth GmbH
 Model Description: Laser Distance Meter
 Model: WDM 6-22
 Test Sample ID: 37319
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Colbasiuc
 Test Date: 2021-12-23
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 3 V DC
 Antenna: Schwarzbeck VULB 9162, Horizontal
 Measurement Distance: 10m, converted to 3m
 Operational Mode& Configuration: Mode 1
 Configuration 1
 Note 1:



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	209.082 MHz	17.4 dBµV/m	43.5 dBµV/m	-26.1 dB	Pass	-170 degrees	4 m
2	228.63 MHz	22 dBµV/m	46 dBµV/m	-24.0 dB	Pass	-170 degrees	4 m
3	235.284 MHz	22.2 dBµV/m	46 dBµV/m	-23.8 dB	Pass	-170 degrees	4 m
4	230.064 MHz	25 dBµV/m	46 dBµV/m	-21.0 dB	Pass	-170 degrees	4 m
5	236.874 MHz	29.5 dBµV/m	46 dBµV/m	-16.6 dB	Pass	-170 degrees	4 m
6	307.98 MHz	20.4 dBµV/m	46 dBµV/m	-25.6 dB	Pass	-170 degrees	4 m

Radiated emissions according to FCC 15B

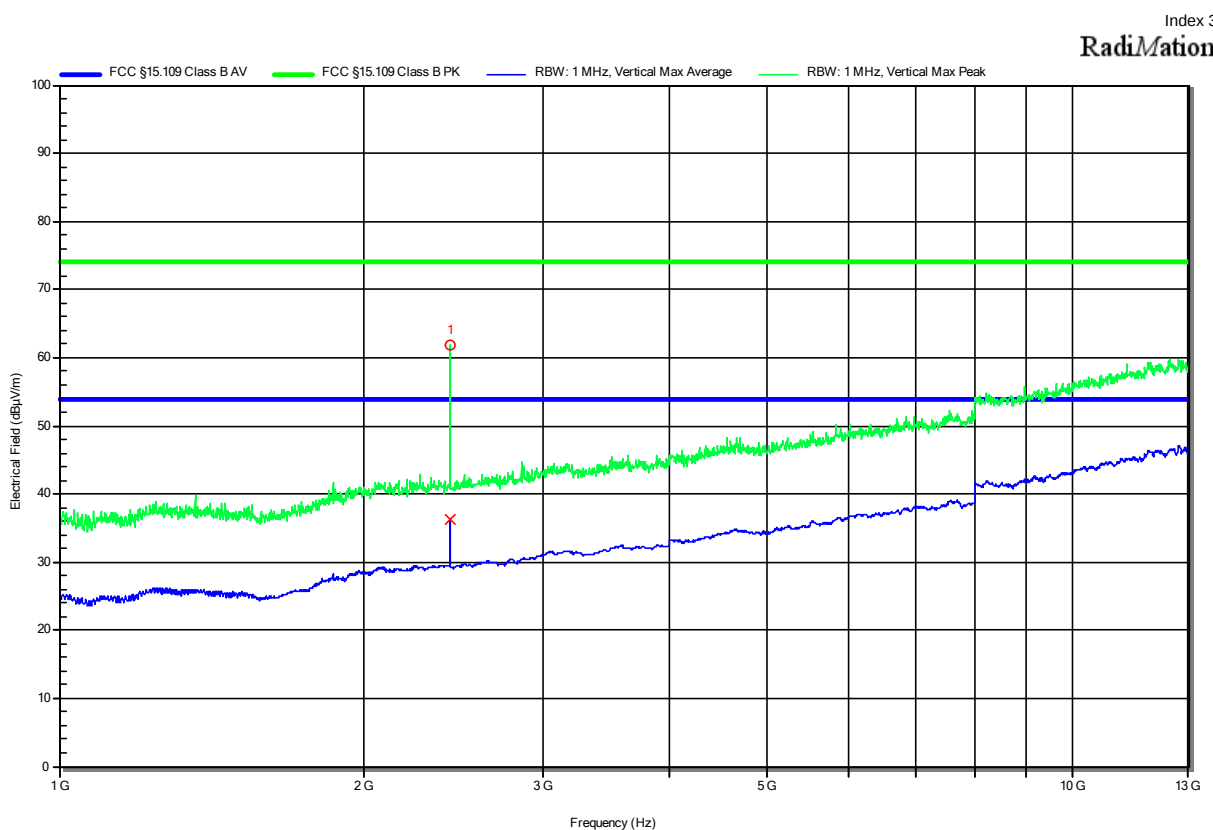
Project Number: G0M-2111-1145
 Applicant: Adolf Würth GmbH
 Model Description: Laser Distance Meter
 Model: WDM 6-22
 Test Sample ID: 37319
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Colbasiuc
 Test Date: 2021-12-23
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 3 V DC
 Antenna: Schwarzbeck VULB 9162, Vertical
 Measurement Distance: 10m, converted to 3m
 Operational Mode& Configuration: Mode 1
 Configuration 1
 Note 1:



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	51 MHz	18.4 dBµV/m	40 dBµV/m	-21.6 dB	Pass	0 degrees	1 m
2	52.5 MHz	17.9 dBµV/m	40 dBµV/m	-22.1 dB	Pass	0 degrees	1 m
3	54.36 MHz	17.8 dBµV/m	40 dBµV/m	-22.2 dB	Pass	0 degrees	1 m
4	58.56 MHz	17 dBµV/m	40 dBµV/m	-23.0 dB	Pass	0 degrees	1 m
5	151.02 MHz	15.5 dBµV/m	43.5 dBµV/m	-28.0 dB	Pass	0 degrees	1 m
6	182.538 MHz	16.7 dBµV/m	43.5 dBµV/m	-26.8 dB	Pass	0 degrees	1 m
7	227.922 MHz	20.5 dBµV/m	46 dBµV/m	-25.5 dB	Pass	0 degrees	1 m

Radiated emissions according to FCC 15B

Project Number: G0M-2111-1145
 Applicant: Adolf Würth GmbH
 Model Description: Laser Distance Meter
 Model: WDM 6-22
 Test Sample ID: 37319
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Colbasiuc
 Test Date: 2021-12-23
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 3 V DC
 Antenna: ETS-Lindgren 3117, Vertical
 Measurement Distance: 3m
 Operational Mode& Configuration: Mode 1
 Configuration 1
 Note 1: Table Position -33°/ Antenna high 1m



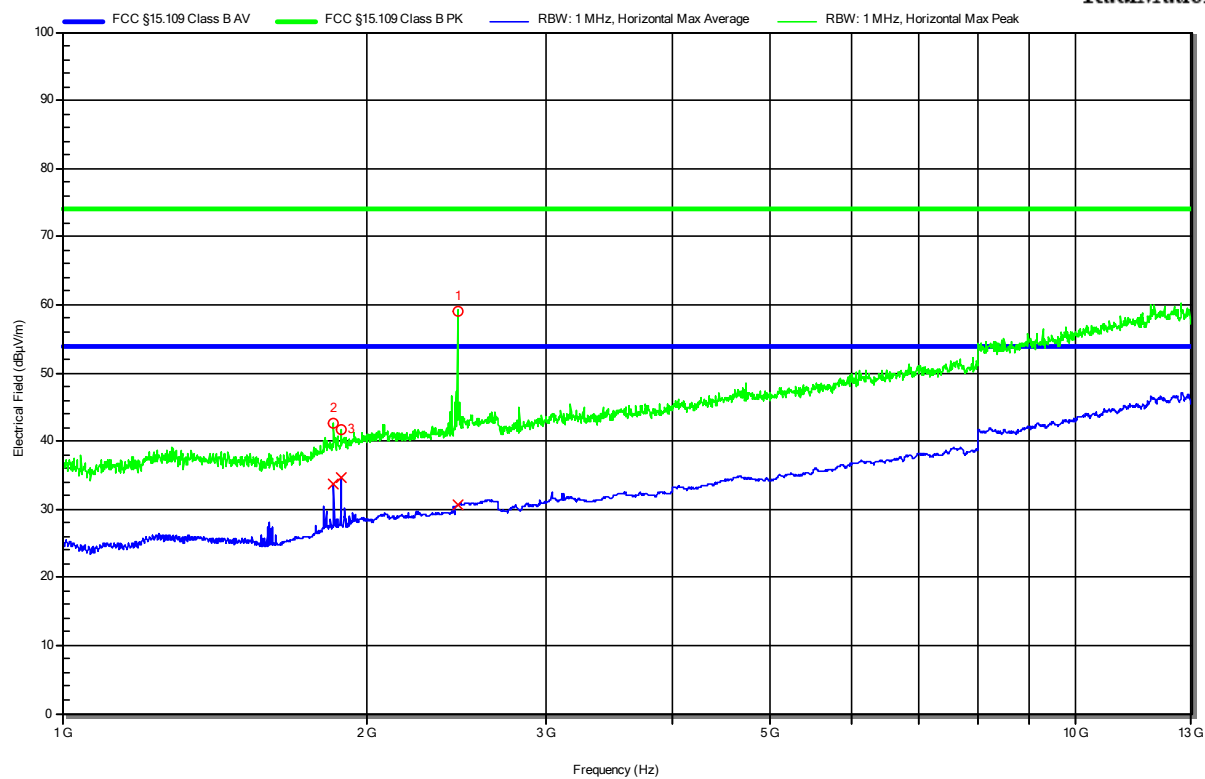
Peak Number	Frequency	Bluetooth	LE
1	2.431 GHz	Carrier	

Radiated emissions according to FCC 15B

Project Number: G0M-2111-1145
 Applicant: Adolf Würth GmbH
 Model Description: Laser Distance Meter
 Model: WDM 6-22
 Test Sample ID: 37319
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Colbasiuc
 Test Date: 2021-12-23
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 3 V DC
 Antenna: ETS-Lindgren 3117, Horizontal
 Measurement Distance: 3m
 Operational Mode& Configuration: Mode 1
 Configuration 1
 Note 1:

Index 4

RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.454 GHz	Bluetooth Carrier	LE				
2	1.852 GHz	42.7 dBµV/m	74 dBµV/m	-31.3 dB	Pass	-135 degrees	1 m
3	1.883 GHz	41.8 dBµV/m	74 dBµV/m	-32.2 dB	Pass	-135 degrees	1 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.454 GHz	Bluetooth Carrier	LE				
2	1.852 GHz	33.8 dBµV/m	54 dBµV/m	-20.2 dB	Pass	-135 degrees	1 m
3	1.883 GHz	34.7 dBµV/m	54 dBµV/m	-19.3 dB	Pass	-135 degrees	1 m

Test Report No.: G0M-2111-1145-EF0115B-V01

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

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
Radiated Emission	30MHz to 1GHz @ 10m, 6.25 dB 1GHz to 18GHz @3m, 4.86 dB