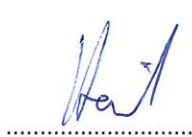


EMC TEST REPORT FCC CFR Title 47 / Chapter I / Subchapter A / Part 15 / Subpart B ISED ICES-003 Issue 7	
Report Reference No	G0M-2209-1690-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	    A2LA - Registration number: 1983.01 (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	digades GmbH
Address	Äußere Weberstraße 20 02763 Zittau DE
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	Head-up display for motorcycle helmets
Model(s)	TILSBERK Head-Up Display
Additional Model(s)	None
Brand Name(s)	TILSBERK Head-Up Display
Hardware Version(s)	HW3622
Software Version(s)	SW0201
FCC-ID	QNFHUD
IC	-
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	2022-12-19	
Report:		
Compiled by	Stephan Liebich	
Tested by (+ signature) (Responsible for Test)	Stephan Liebich	
Approved by (+ signature) (Senior EMC Test Technician)	Matthias Handrik	
Date of Issue	2023-02-20	
Total number of pages	43	
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.		
Statement concerning the uncertainty of the measurement systems used for decisions on conformity (decision rule): 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. Compliance or non-compliance with a disturbance limit is determined in the following manner. - 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. 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.		
Additional Comments:		
None		

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	2023-02-20	Initial Release	-

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2.2	Test Conditions and Results - Conducted emissions acc. to ANSI C63.4.....	35
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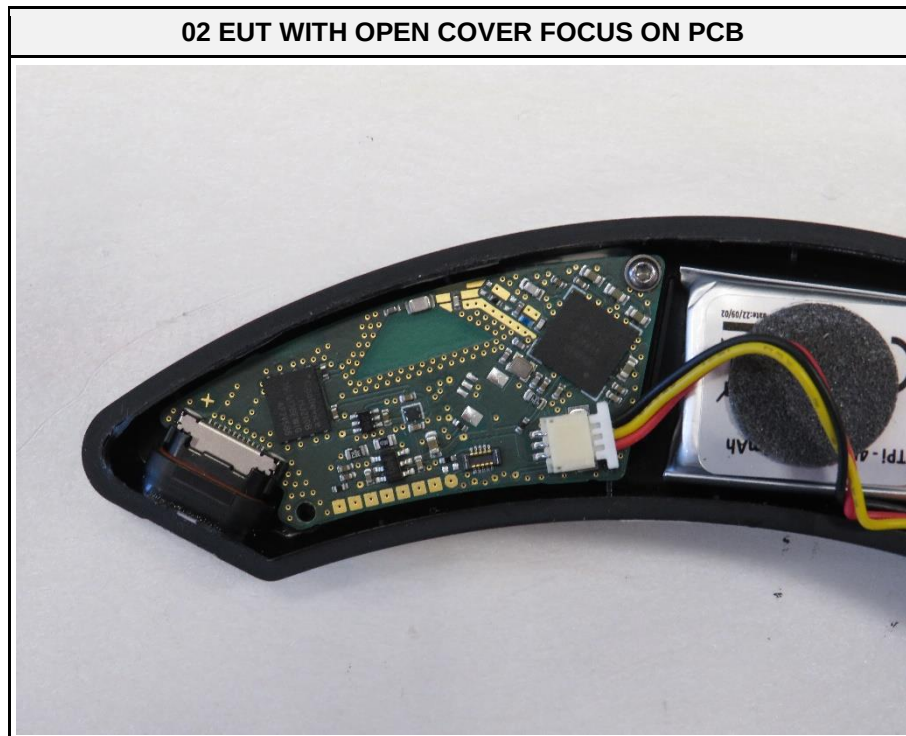
1 Equipment (Test Item) Under Test

Description	Head-up display for motorcycle helmets		
Intended Use	The TILSBERK Head-Up Display gives you the freedom to decide for yourself what is important during your motorcycle ride. The individually configurable head-up display was developed for your independence and safety. You no longer have to look down while riding to read the speed, navigation or compass. The information is displayed directly in front of your eyes. So you always have always have everything in view.		
Model	TILSBERK Head-Up Display		
Additional Model(s)	None		
Brand Name(s)	TILSBERK Head-Up Display		
Hardware Version(s)	HW3622		
Software Version(s)	SW0201		
Number of tested samples	1		
Sample Identification	EUT #	Sample-ID	Serial Number
	EUT 1	42438	0003162
EUT Dimensions [cm]	13.96 x 4.93 x 2.18		
FCC-ID	QNFHUD		
IC	--		
Class	Class B		
Equipment type	Table top		
Highest internal frequency [MHz]	64 (Radio frequency 2480MHz: Bluetooth Low Energy)		
Protective Earth	No		
Functional Earth	No		
Radio Module	Type	Bluetooth Low Energy (BLE)	
	Model	nRF52840-QIAA	
	Manufacturer	NORDIC Semiconductor	
	FCC-ID	--	
	IC	--	
Supply Voltage	V _{NOM}	3.7 V DC via internal rechargeable lithium battery 5 V DC via USB connection	
AC/DC-Adaptor	None		
Manufacturer	digades GmbH Äußere Weberstraße 20 02763 Zittau DE		
Factory	digades GmbH Äußere Weberstraße 20 02763 Zittau DE		

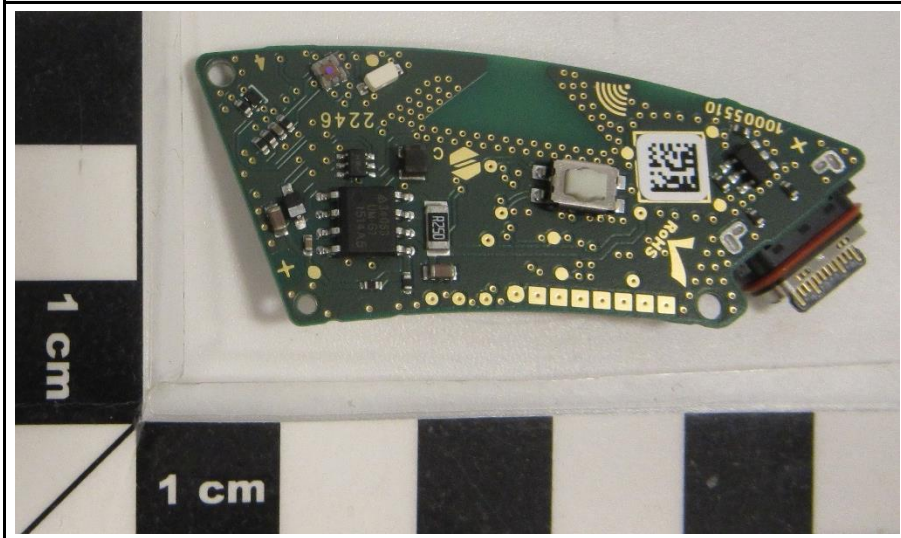
1.1 Equipment Ports

Name	Type	Attributes	Comment
USB	DC/IO	Count: 1 Cable length [m]: 1 Direction: IO Service only: No Shielded: Yes	Charging only; no data transmission
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		

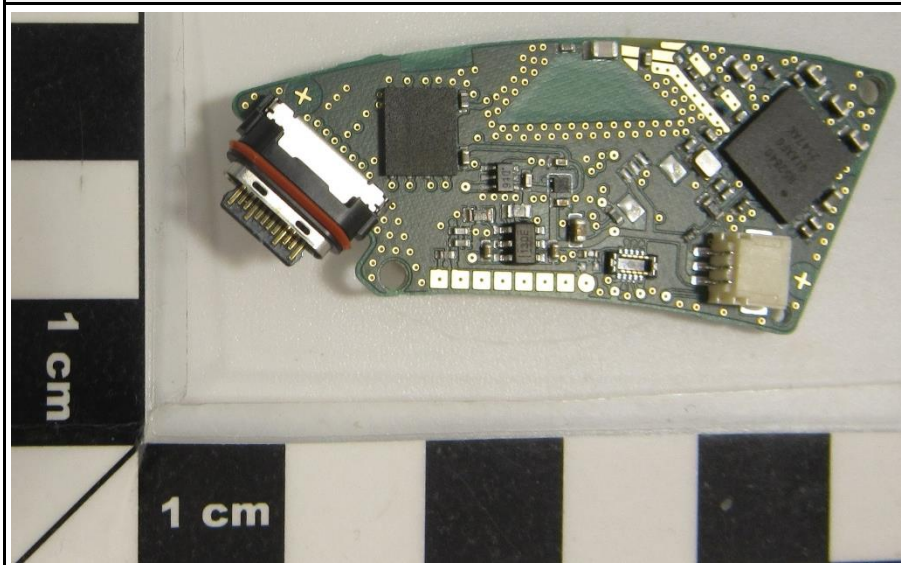
1.2 Equipment Photos - Internal



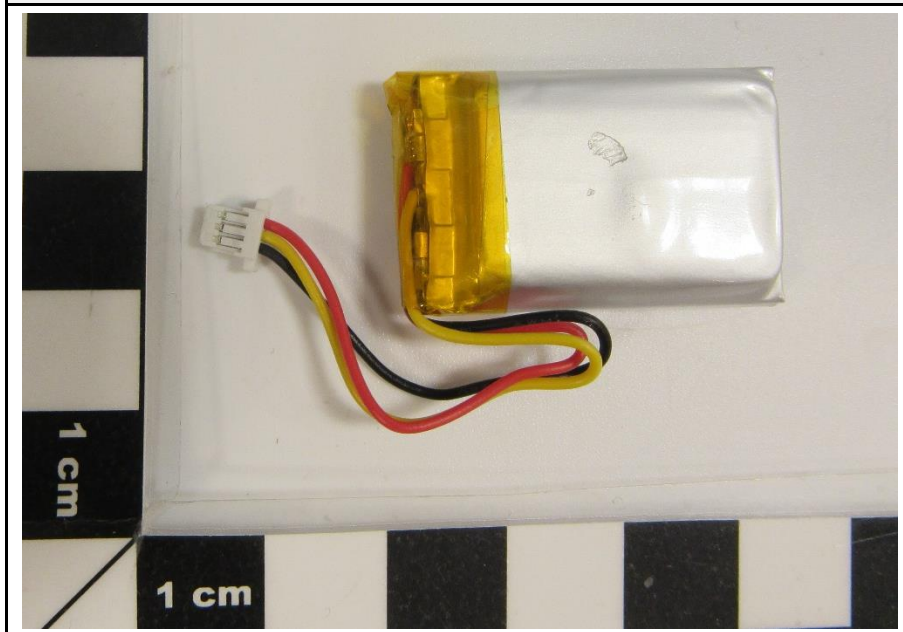
03 EUT PCB BOTTOM SIDE



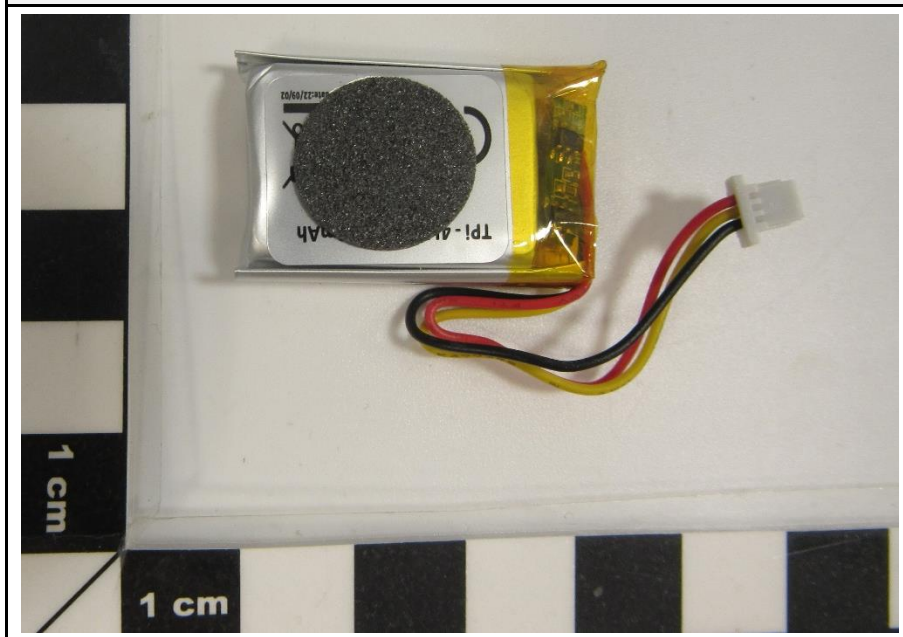
04 EUT PCB TOP SIDE



05 EUT BATTERY BOTTOM SIDE

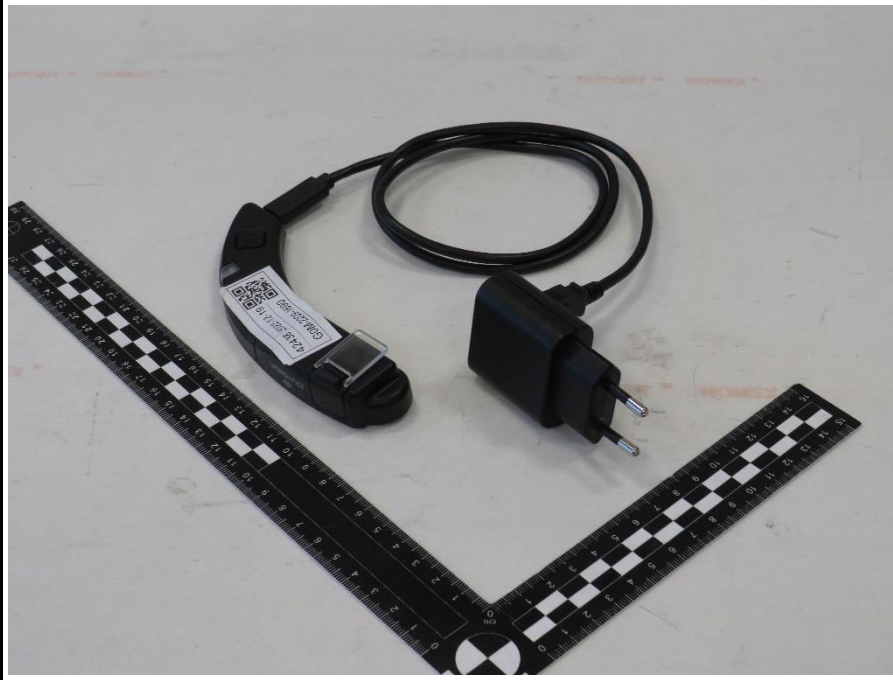


06 EUT BATTERY TOP SIDE

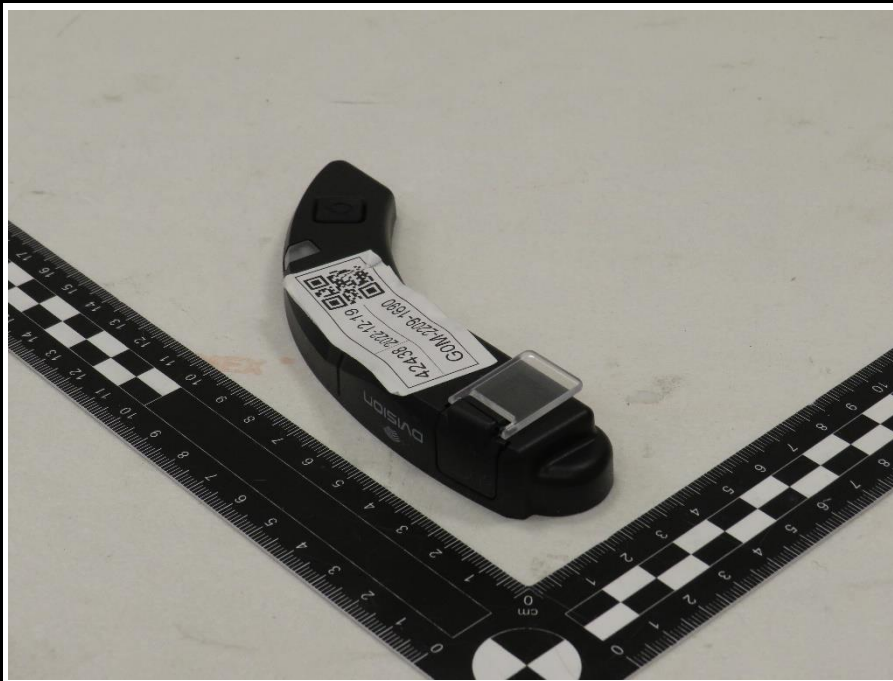


1.3 Equipment Photos - External

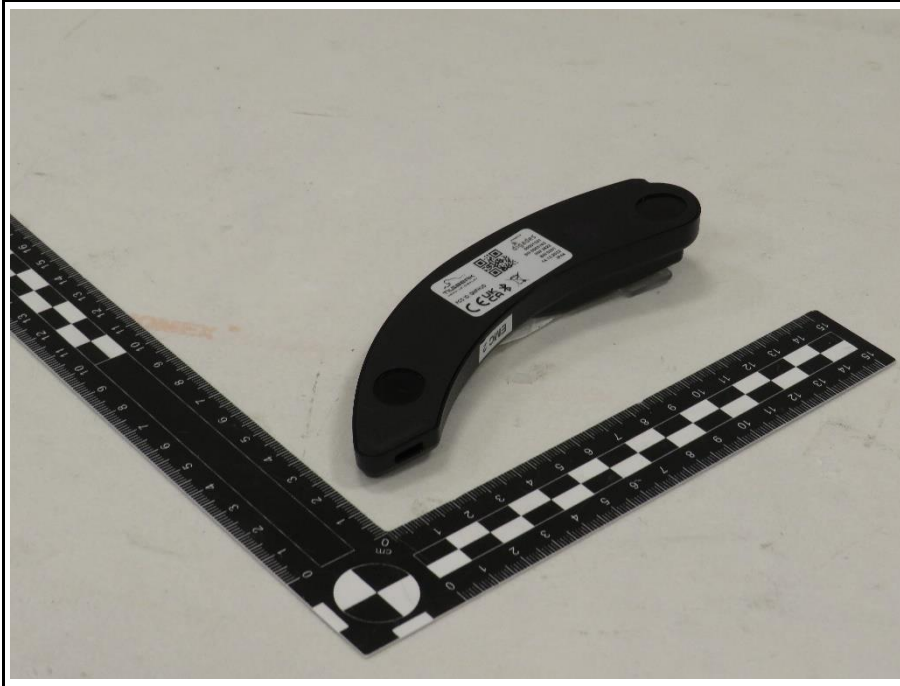
01 EUT WITH SUPPORT EQUIPMENT IN PERSPECTIVE



02 EUT IN PERSPECTIVE I



03 EUT IN PERSPECTIVE II



04 EUT TOP SIDE



05 EUT REAR SIDE



06 EUT LEFT SIDE



07 EUT RIGHT SIDE



08 EUT BOTTOM SIDE



09 EUT FRONT SIDE



10 EUT FRONT SIDE WITH TILSBERK BRAND NAME



11 EUT LABEL



1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	AC/DC-adapter	BlackBerry	PSM03E-050Q-3	--
AE/MON	Smartphone	Apple	iPhone 12 mini	Customer Support Equipment
SW	App	DVISION	3.162	Firmware 1.2.14; Customer Support Equipment
CBL	USB cable	Copartner	LL84201	1 m
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
SW	Software			
Comment: --				

1.5 Operational Modes

Mode #	Description
1	Permanent connection to Smartphone via BLE connection. App shows status data of the EUT display on Smartphone. Display on and shows status data.
2	Internal battery is charging via USB connection. BLE is off. Display on and shows status data.
Comment:	

1.6 EUT Configuration

Configuration #	Description
1	EUT is powered by 3.7 V DC via internal rechargeable lithium battery. EUT is connected with Smartphone via BLE connection
2	EUT is powered by 5 V DC via USB connection. EUT is connected with AC/DC-adapter via USB cable. AC/DC-adapter is powered by external laboratory power supply unit. Cable shield of the USB cable is connected on both sides of EUT and AC/DC-adapter.
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:				

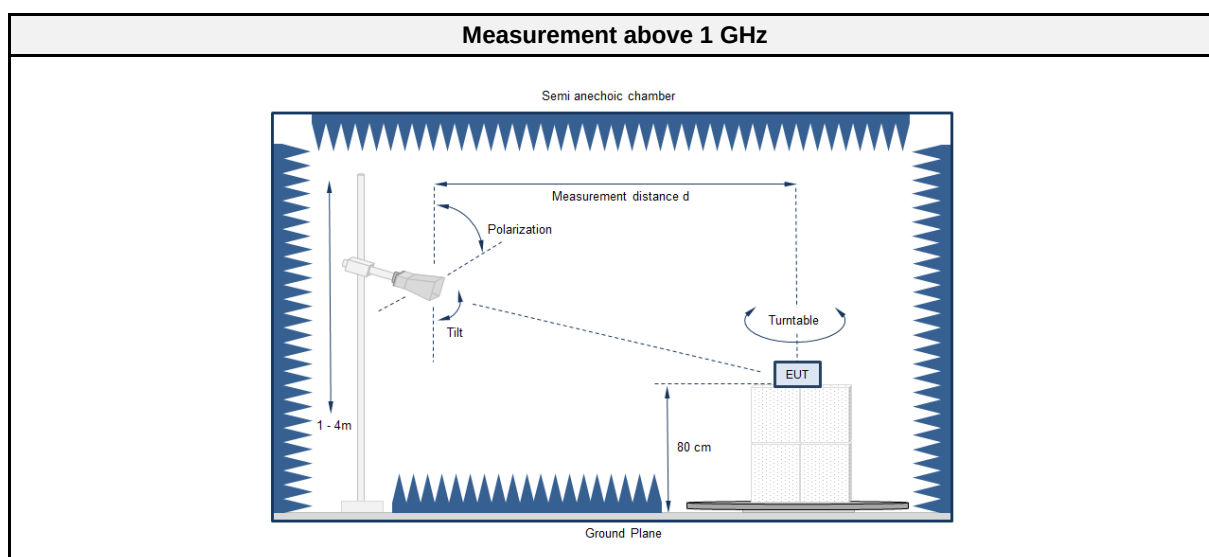
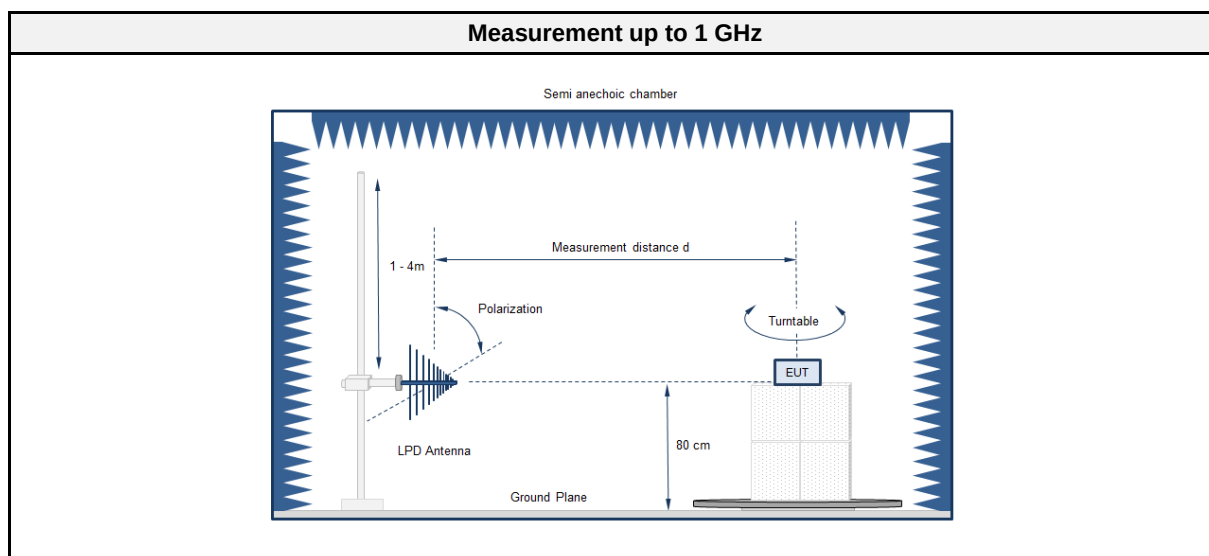
Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

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

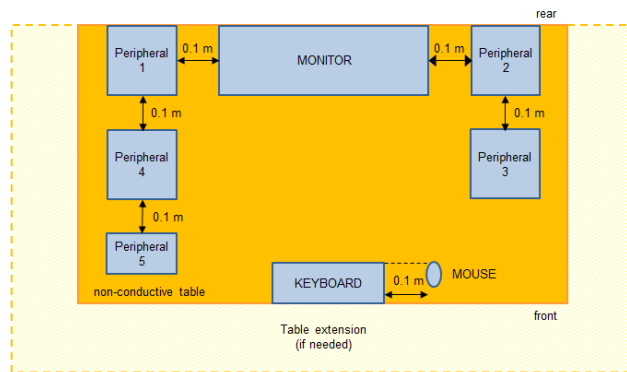
2.1.1 Information

Test Information	
Reference	FCC 15.109, ICES-003, 3.2.2
Reference method	ANSI C63.4:2014+A1:2017 Section 8
Equipment class	Class B
Equipment type	Table top / Floor standing
Highest internal frequency [MHz]	2480
Measurement range	30 MHz to 13000 MHz
Temperature [°C]	20 – 22
Humidity [%]	27 – 33
Operator	Stephan Liebich
Date	2023-02-16

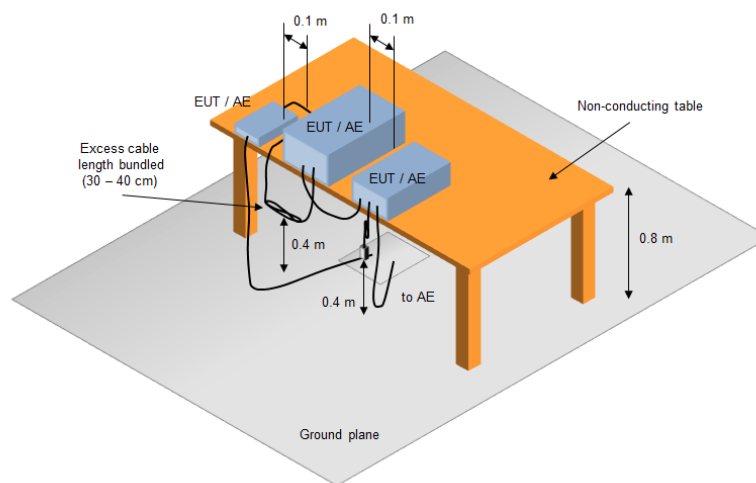
2.1.2 Setup *Table top*:



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
Programmable AC Source	Chroma ATE Inc.	61604	EF01068	2021-07	2023-07
Horn Antenna	Schwarzbeck	BBHA9120D	EF00018	2022-12	2025-12
EMI Test Receiver	Rohde & Schwarz Vertriebs GmbH	ESU8	EF00379	2022-10	2023-10
Spectrum analyzer	Rohde & Schwarz GmbH & Co. KG	FSU43	EF01631	2022-08	2023-08
Trilog Broadband Antenna	Schwarzbeck	VULB 9168	EF01824	2022-10	2023-10
Climatic Sensor	Embedded Data Systems, LLC.	2800100000254 17E	EF01054	2022-04	2023-04

2.1.4 Procedure

Exploratory measurement Table top
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 3m. 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 3m Table top
1. The EUT was placed on a 0.8 m non-conductive table at a 3m 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 – 1000 MHz. Above 1 GHz the antenna was placed on an adjustable height antenna mast. If required, in the range 1- 18 GHz a double ridged broadband horn antenna was used, from 18 – 26.5 GHz the AT4560 and above 26.5 GHz the antenna CBL26402075. 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

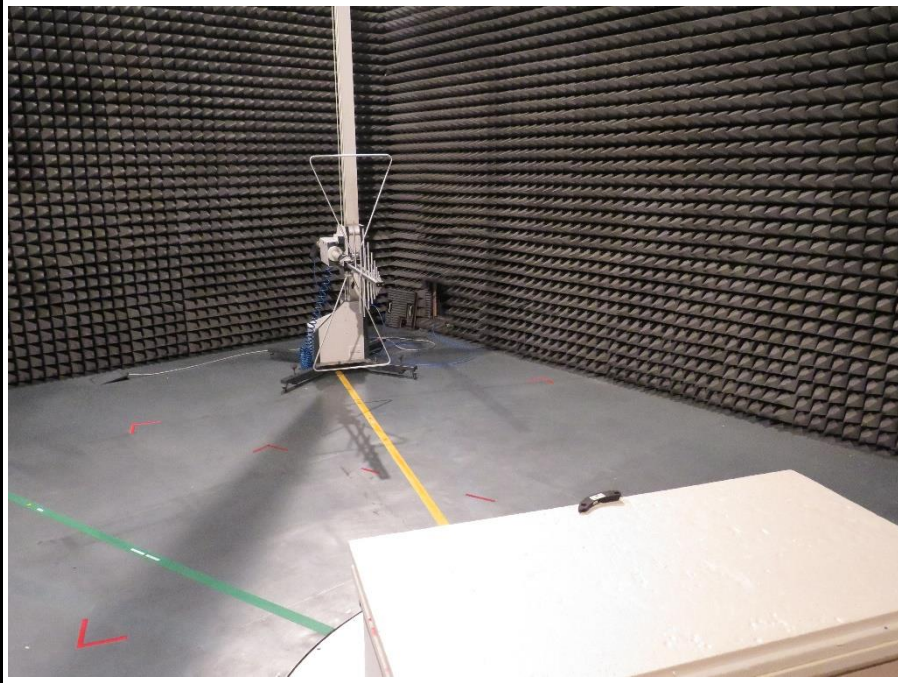
Class B @ 3 m		
Frequency [MHz]	Detector	Limit [dB μ V/m]
30 - 88	Quasi-peak	40
88 - 216	Quasi-peak	43.5
216 - 960	Quasi-peak	46
960 - 1000	Quasi-peak	54
> 1000	Peak	74
	Average	54

2.1.6 Results

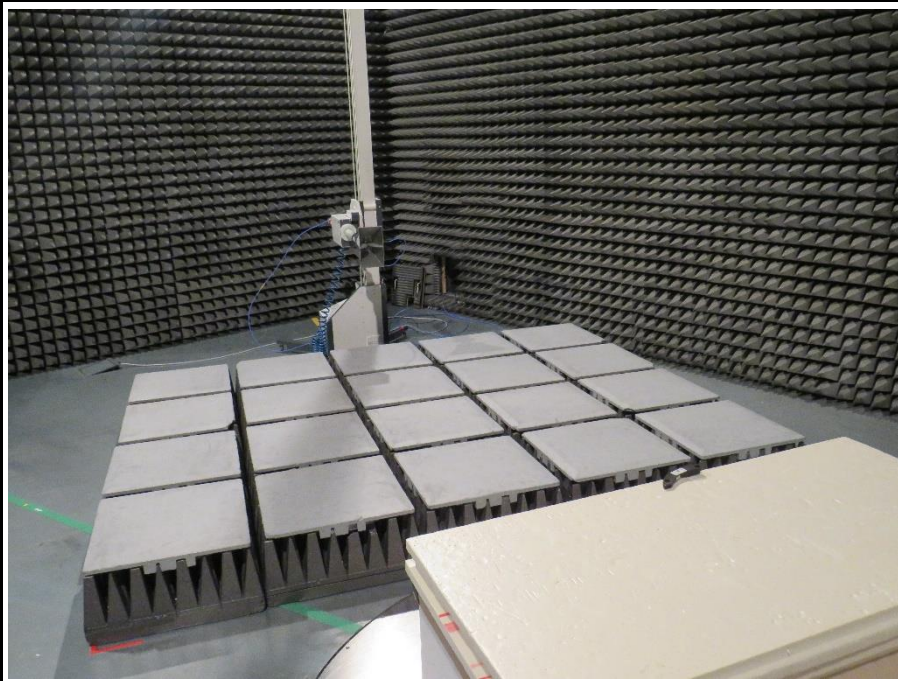
Results			
Operational mode	EUT Configuration	Verdict	Remark
1	1	PASS	3.7 V DC
2	2	PASS	5 V DC
Comment: --			

2.1.7 Setup Photos

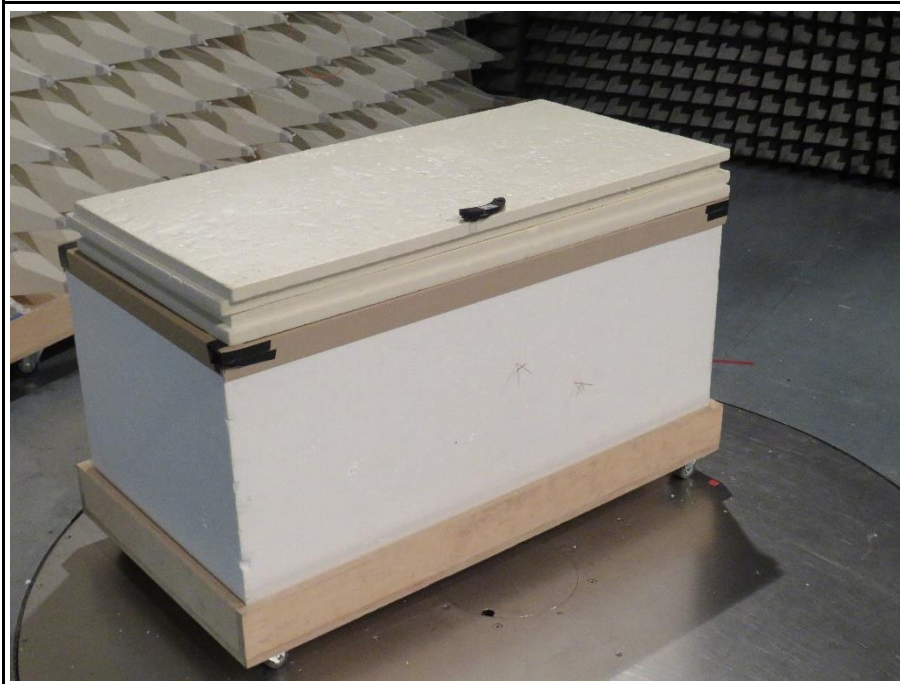
01 TEST SETUP - 30 MHz to 1 GHz - CONFIGURATION 1



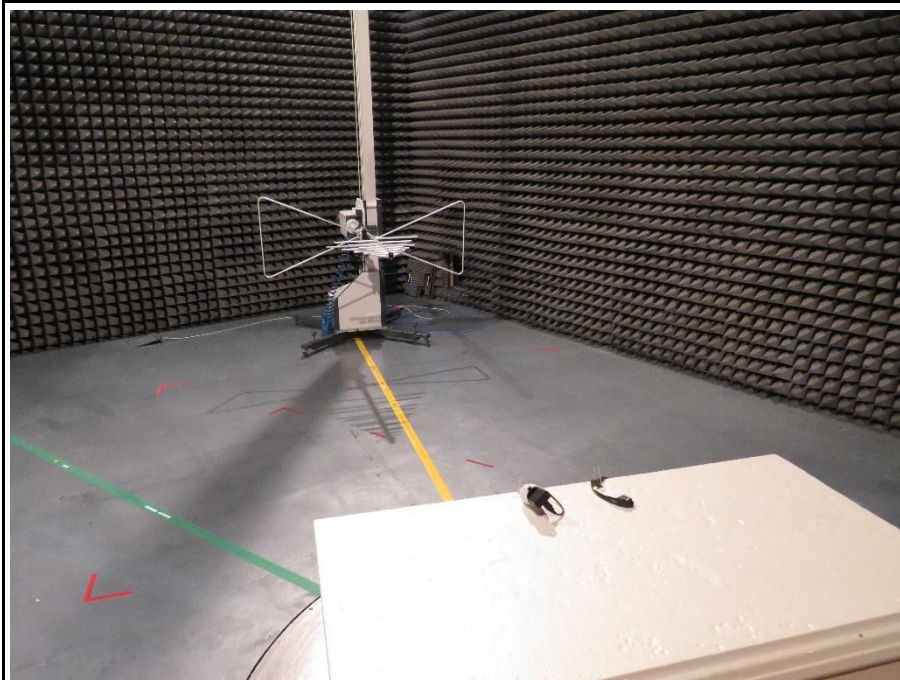
02 TEST SETUP - 1 GHz to 13 GHz - CONFIGURATION 1



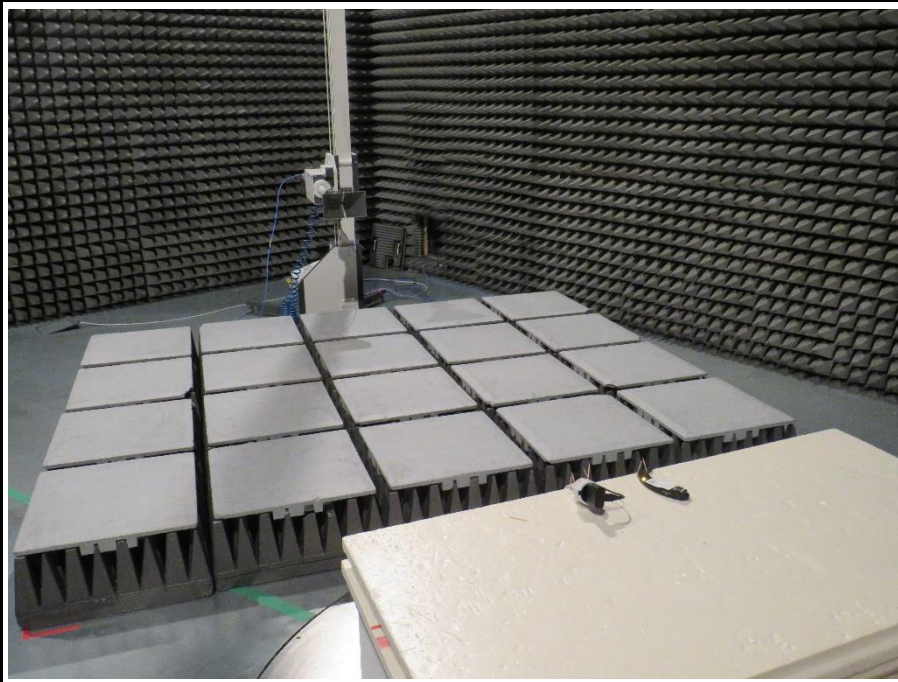
03 TEST SETUP - FOCUS - CONFIGURATION 1



04 TEST SETUP - 30 MHz to 1 GHz - CONFIGURATION 2



05 TEST SETUP - 1 GHz to 13 GHz - CONFIGURATION 2



06 TEST SETUP - FOCUS - CONFIGURATION 1



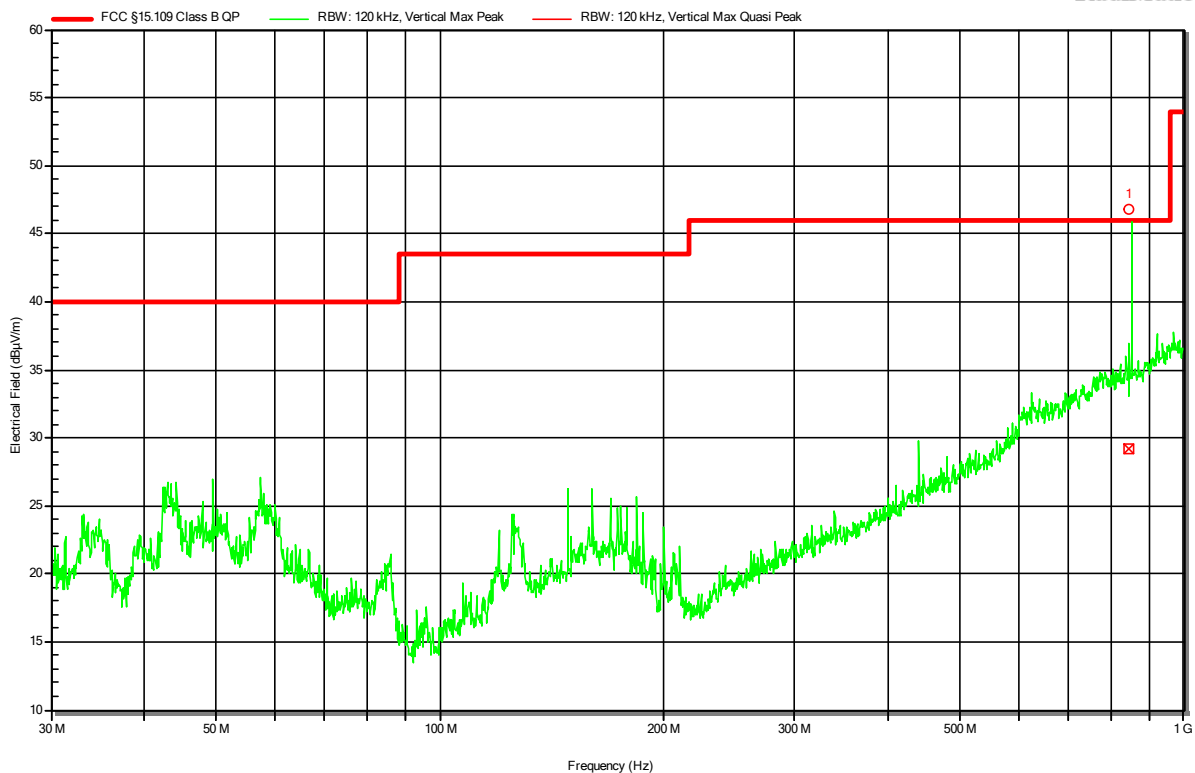
2.1.8 Records

Radiated emissions according to FCC part 15B

Project Number: G0M-2209-1690
 Applicant: digades GmbH
 Model Description: Head-up display for motorcycle helmets
 Model: TILSBERK Head-Up Display
 Test Sample ID: 42438
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Neuner
 Test Date: 2023-02-16
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 3.7 V DC via internal rechargeable lithium battery
 Antenna: Schwarzbeck VULB 9168, Vertical
 Measurement Distance: 3m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1: --

Index 8

RadiMation



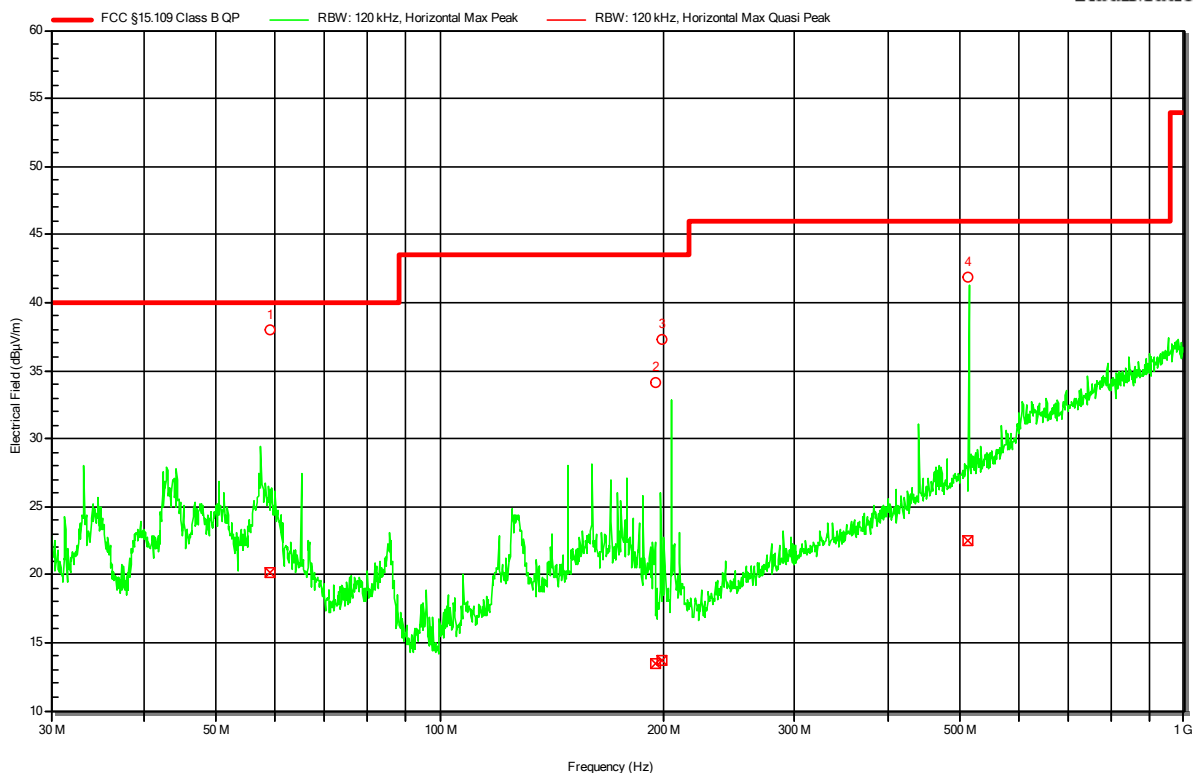
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	842.76 MHz	29.22 dBµV/m	46.02 dBµV/m	-16.8 dB	Pass	0 degrees	1 m

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

Project Number: G0M-2209-1690
 Applicant: digades GmbH
 Model Description: Head-up display for motorcycle helmets
 Model: TILSBERK Head-Up Display
 Test Sample ID: 42438
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Neuner
 Test Date: 2023-02-16
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 3.7 V DC via internal rechargeable lithium battery
 Antenna: Schwarzbeck VULB 9168, Horizontal
 Measurement Distance: 3m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1: --

Index 7

RadiMation



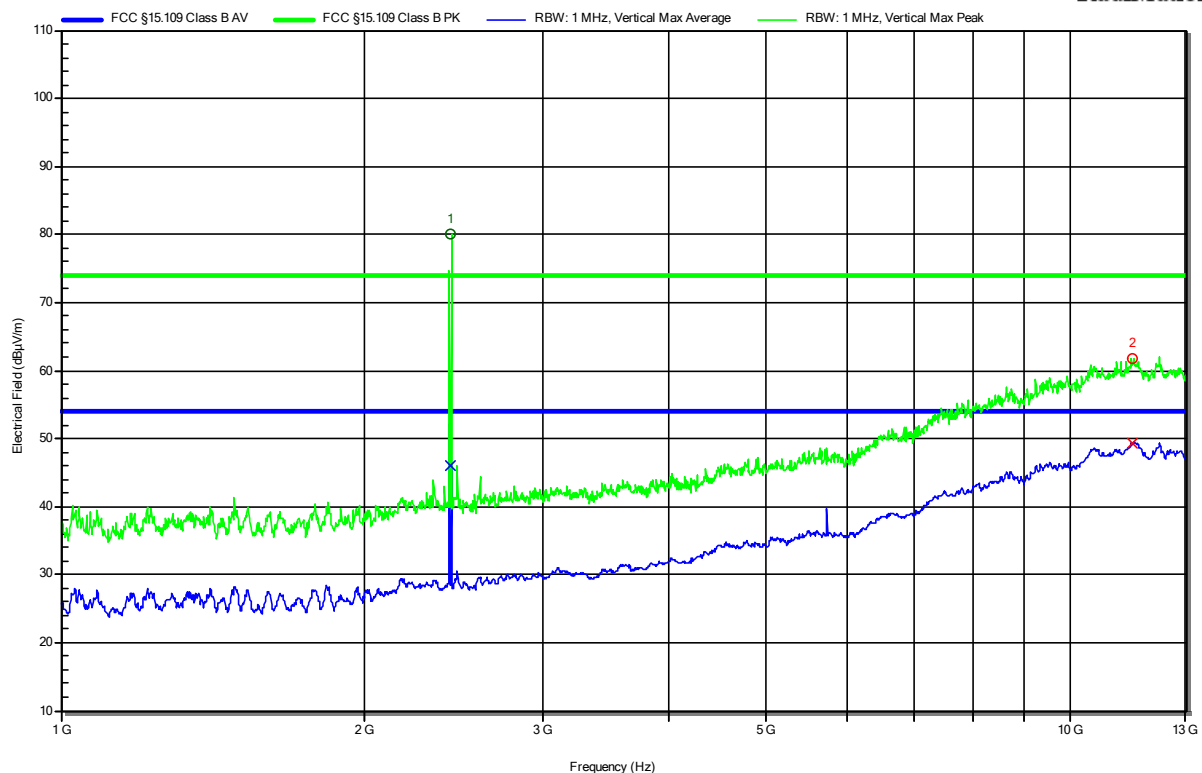
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	59.1 MHz	20.15 dBμV/m	40 dBμV/m	-19.85 dB	Pass	0 degrees	1 m
2	195.36 MHz	13.49 dBμV/m	43.52 dBμV/m	-30.04 dB	Pass	0 degrees	1 m
3	199.32 MHz	13.69 dBμV/m	43.52 dBμV/m	-29.83 dB	Pass	0 degrees	1 m
4	513.66 MHz	22.55 dBμV/m	46.02 dBμV/m	-23.47 dB	Pass	0 degrees	1 m

Radiated emissions according to FCC part 15B

Project Number: G0M-2209-1690
 Applicant: digades GmbH
 Model Description: Head-up display for motorcycle helmets
 Model: TILSBERK Head-Up Display
 Test Sample ID: 42438
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2023-02-16
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 3.7 V DC via internal rechargeable lithium battery
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement Distance: 3m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1: --

Index 4

RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.435 GHz	BLE-carrier					
2	11.527 GHz	61.66 dBμV/m	73.98 dBμV/m	-12.32 dB	Pass	0 degrees	2.9 m

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.435 GHz	BLE-carrier					
2	11.527 GHz	49.31 dBμV/m	53.98 dBμV/m	-4.67 dB	Pass	0 degrees	2.9 m

Test Report No.: G0M-2209-1690-EF0115B-V01

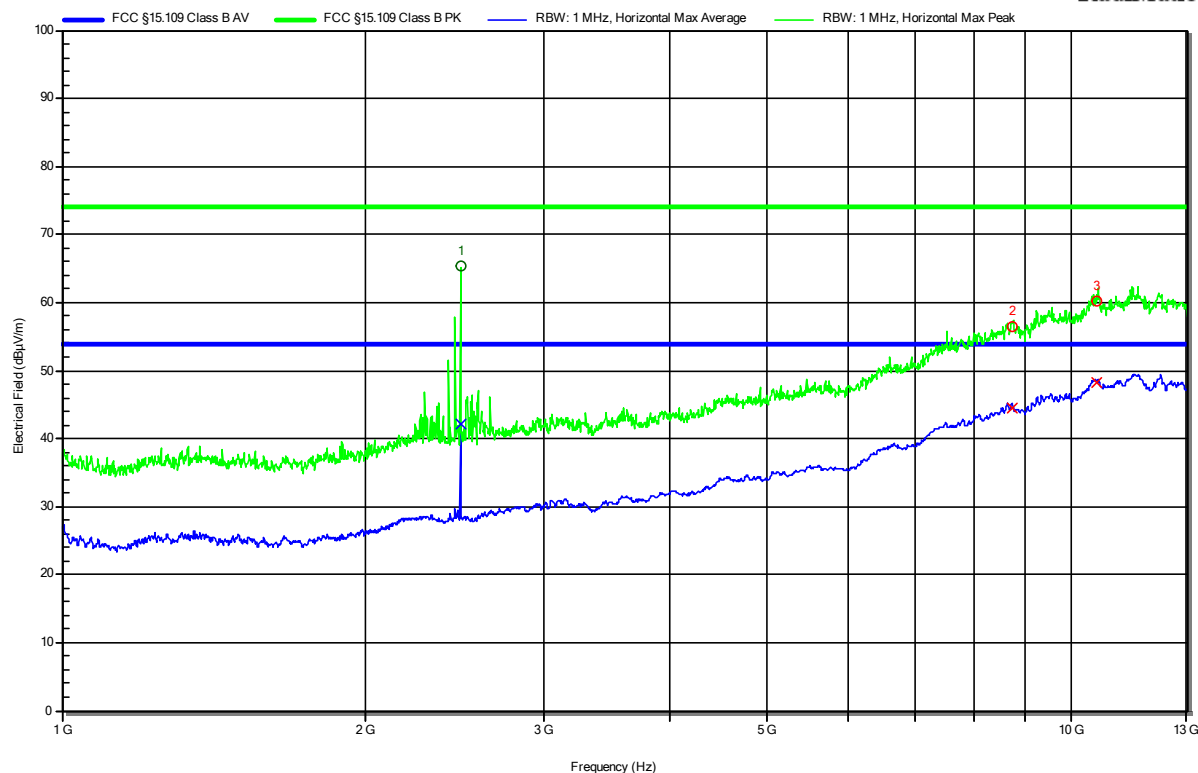
Eurofins Product Service GmbH
 Storkower Str. 38c, D-15526 Reichenwalde, Germany

Radiated emissions according to FCC part 15B

Project Number: G0M-2209-1690
 Applicant: digades GmbH
 Model Description: Head-up display for motorcycle helmets
 Model: TILSBERK Head-Up Display
 Test Sample ID: 42438
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2023-02-16
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 3.7 V DC via internal rechargeable lithium battery
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement Distance: 3m
 Operational Mode: 1
 EUT Configuration: 1
 Note 1: --

Index 3

RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.481 GHz	BLE-carrier					
2	8.744 GHz	56.5 dBµV/m	73.98 dBµV/m	-17.48 dB	Pass	0 degrees	2 m
3	10.577 GHz	60.17 dBµV/m	73.98 dBµV/m	-13.81 dB	Pass	0 degrees	2 m

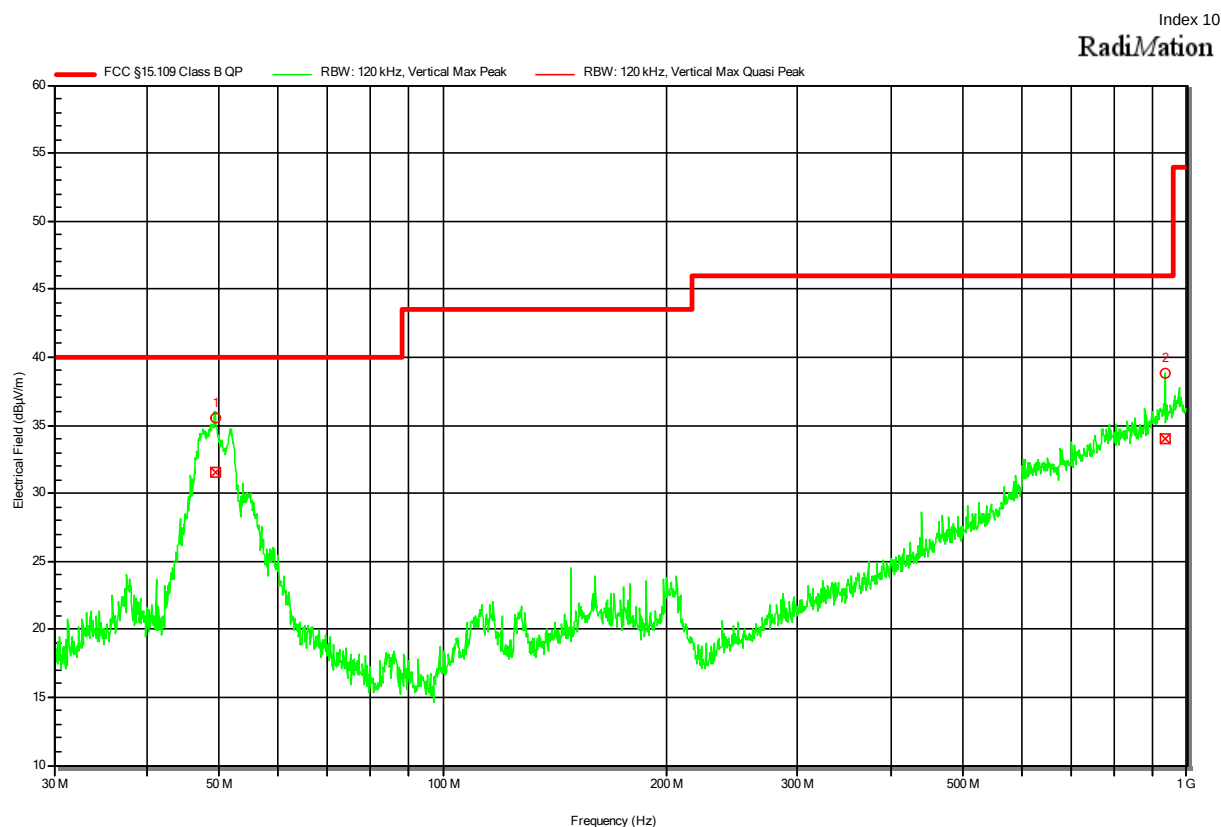
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.481 GHz	BLE-carrier					
2	8.744 GHz	44.58 dBµV/m	53.98 dBµV/m	-9.4 dB	Pass	0 degrees	2 m
3	10.577 GHz	48.18 dBµV/m	53.98 dBµV/m	-5.8 dB	Pass	0 degrees	2 m

Test Report No.: G0M-2209-1690-EF0115B-V01

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

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

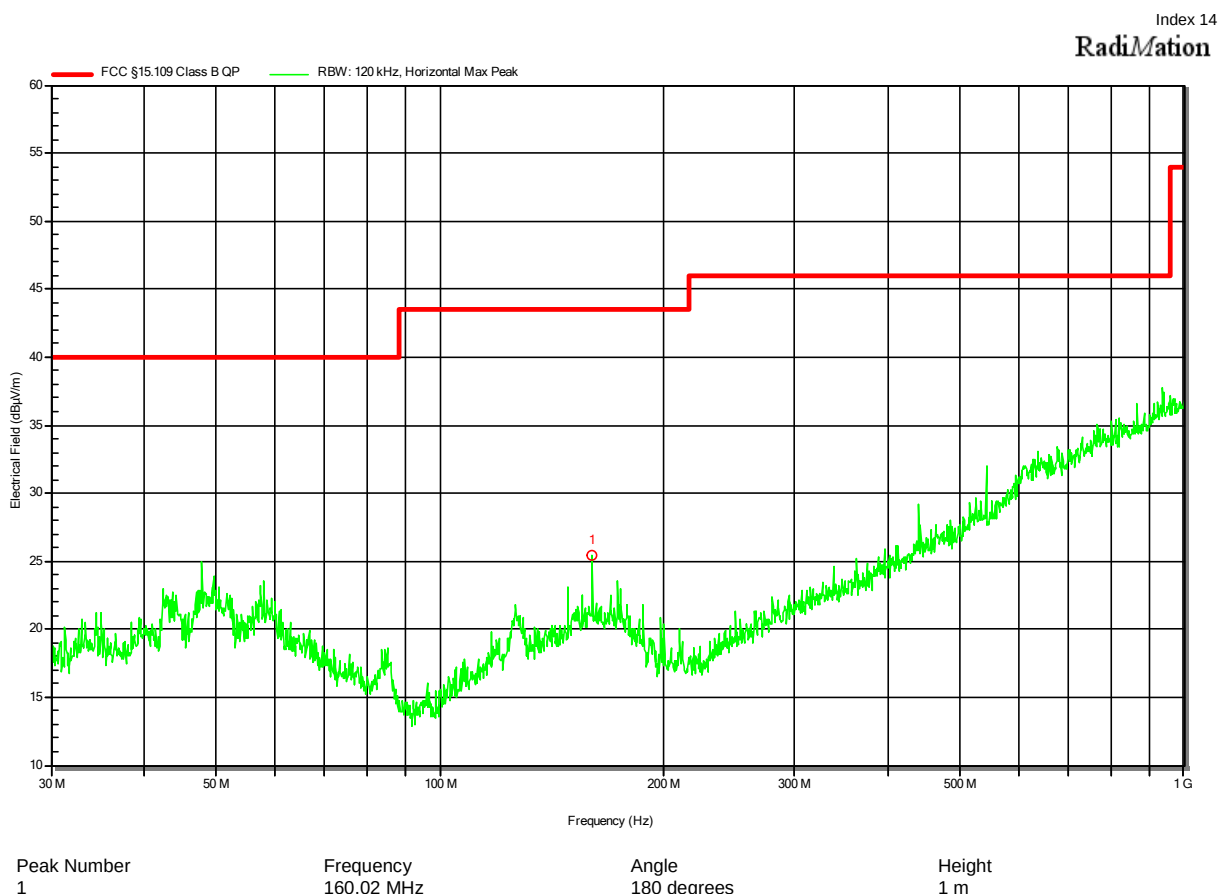
Project Number: G0M-2209-1690
 Applicant: digades GmbH
 Model Description: Head-up display for motorcycle helmets
 Model: TILSBERK Head-Up Display
 Test Sample ID: 42438
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Neuner
 Test Date: 2023-02-16
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 5 V DC via USB connection and AC/DC-Adapter (120 V AC / 60 Hz)
 Antenna: Schwarzbeck VULB 9168, Vertical
 Measurement Distance: 3m
 Operational Mode: 2
 EUT Configuration: 2
 Note 1: --



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	49.38 MHz	31.58 dBµV/m	40 dBµV/m	-8.42 dB	Pass	180 degrees	1 m
2	936.138 MHz	33.96 dBµV/m	46.02 dBµV/m	-12.06 dB	Pass	180 degrees	1 m

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

Project Number: G0M-2209-1690
 Applicant: digades GmbH
 Model Description: Head-up display for motorcycle helmets
 Model: TILSBERK Head-Up Display
 Test Sample ID: 42438
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Neuner
 Test Date: 2023-02-16
 Operating Conditions: ambient temperature: 23 °Celsius
 power input: 5 V DC via USB connection and AC/DC-Adapter (120 V AC / 60 Hz)
 Antenna: Schwarzbeck VULB 9168, Horizontal
 Measurement Distance: 3m
 Operational Mode: 2
 EUT Configuration: 2
 Note 1: --

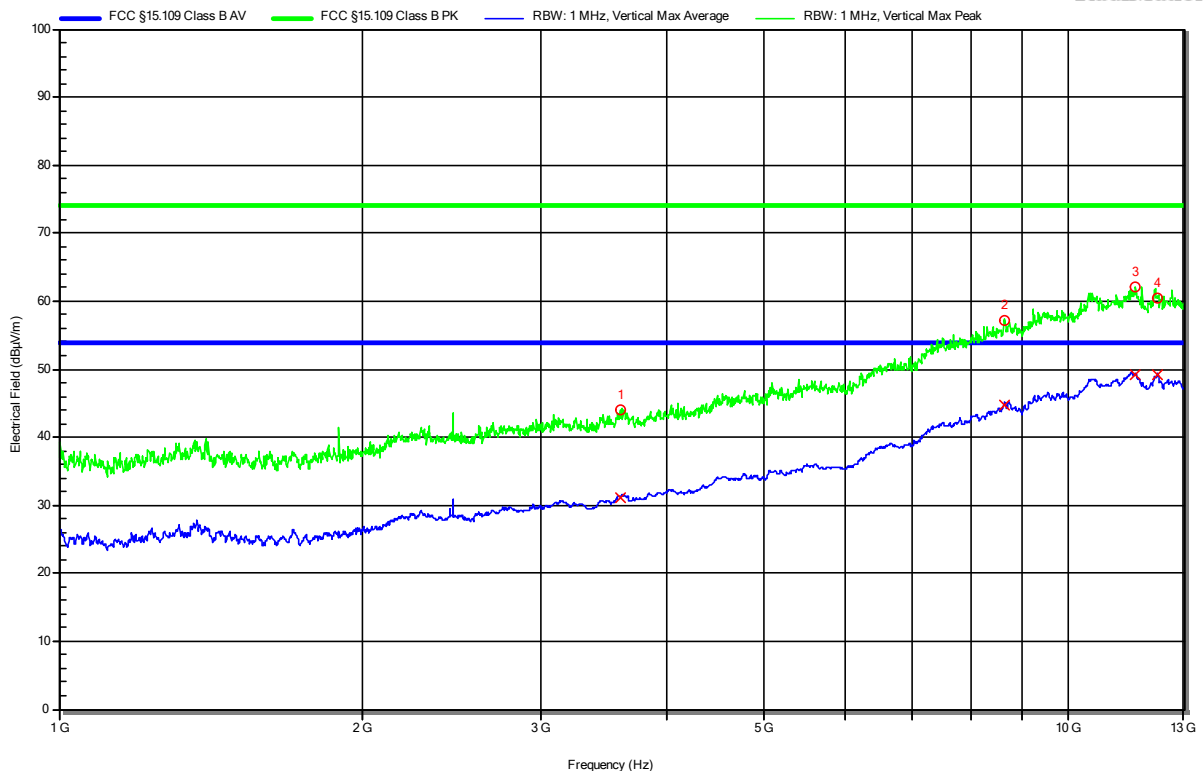


Radiated emissions according to FCC part 15B

Project Number: G0M-2209-1690
 Applicant: digades GmbH
 Model Description: Head-up display for motorcycle helmets
 Model: TILSBERK Head-Up Display
 Test Sample ID: 42438
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2023-02-16
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 5 V DC via USB connection and AC/DC-Adapter (120 V AC / 60 Hz)
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement Distance: 3m
 Operational Mode: 2
 EUT Configuration: 2
 Note 1: --

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Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	3.605 GHz	44.06 dBµV/m	73.98 dBµV/m	-29.92 dB	Pass	0 degrees	1 m
2	8.639 GHz	57.05 dBµV/m	73.98 dBµV/m	-16.93 dB	Pass	0 degrees	1 m
3	11.641 GHz	62.11 dBµV/m	73.98 dBµV/m	-11.87 dB	Pass	0 degrees	1 m
4	12.247 GHz	60.33 dBµV/m	73.98 dBµV/m	-13.65 dB	Pass	0 degrees	1 m

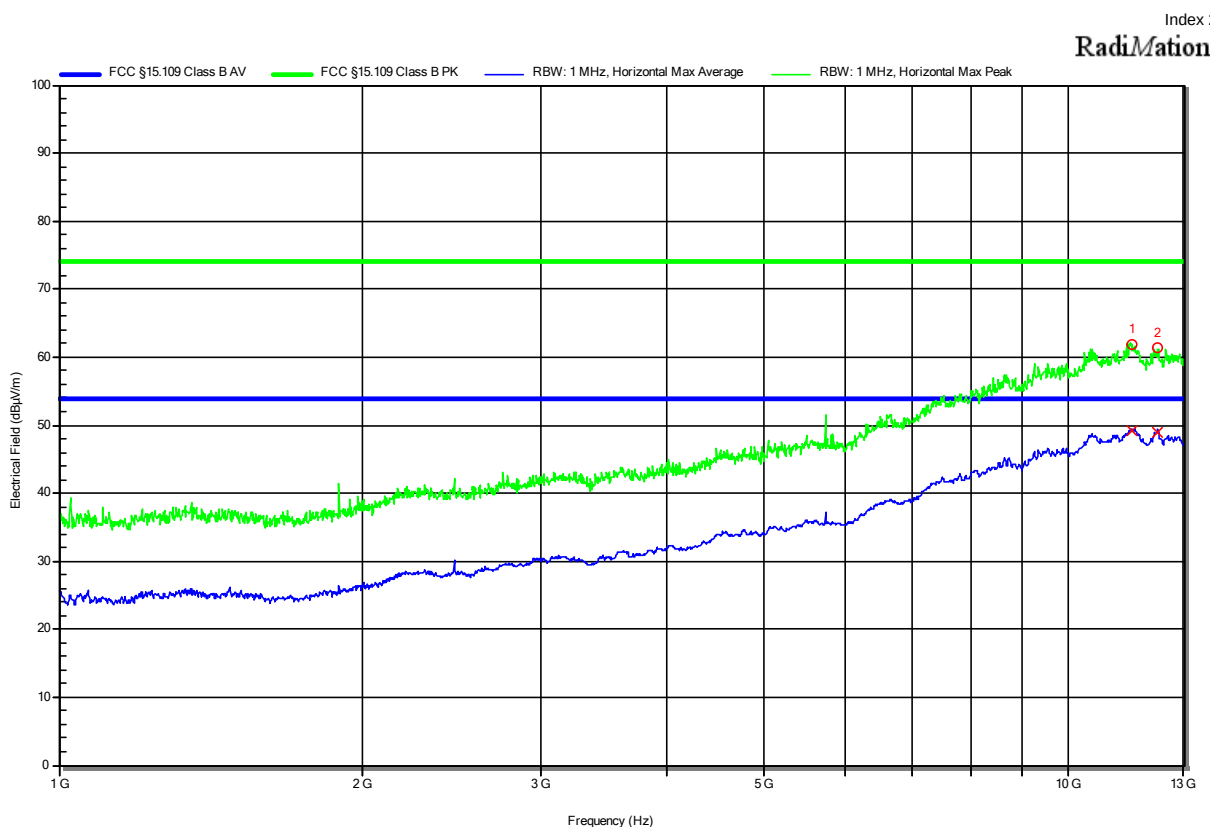
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	3.605 GHz	31.21 dBµV/m	53.98 dBµV/m	-22.77 dB	Pass	0 degrees	1 m
2	8.639 GHz	44.71 dBµV/m	53.98 dBµV/m	-9.27 dB	Pass	0 degrees	1 m
3	11.641 GHz	49.14 dBµV/m	53.98 dBµV/m	-4.84 dB	Pass	0 degrees	1 m
4	12.247 GHz	49.06 dBµV/m	53.98 dBµV/m	-4.92 dB	Pass	0 degrees	1 m

Test Report No.: G0M-2209-1690-EF0115B-V01

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

Radiated emissions according to FCC part 15B

Project Number: G0M-2209-1690
 Applicant: digades GmbH
 Model Description: Head-up display for motorcycle helmets
 Model: TILSBERK Head-Up Display
 Test Sample ID: 42438
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2023-02-16
 Operating Conditions: ambient temperature: 21 °Celsius
 power input: 5 V DC via USB connection and AC/DC-Adapter (120 V AC / 60 Hz)
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement Distance: 3m
 Operational Mode: 2
 EUT Configuration: 2
 Note 1: --



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	11.555 GHz	61.96 dBµV/m	73.98 dBµV/m	-12.02 dB	Pass	0 degrees	1 m
2	12.25 GHz	61.3 dBµV/m	73.98 dBµV/m	-12.68 dB	Pass	0 degrees	1 m

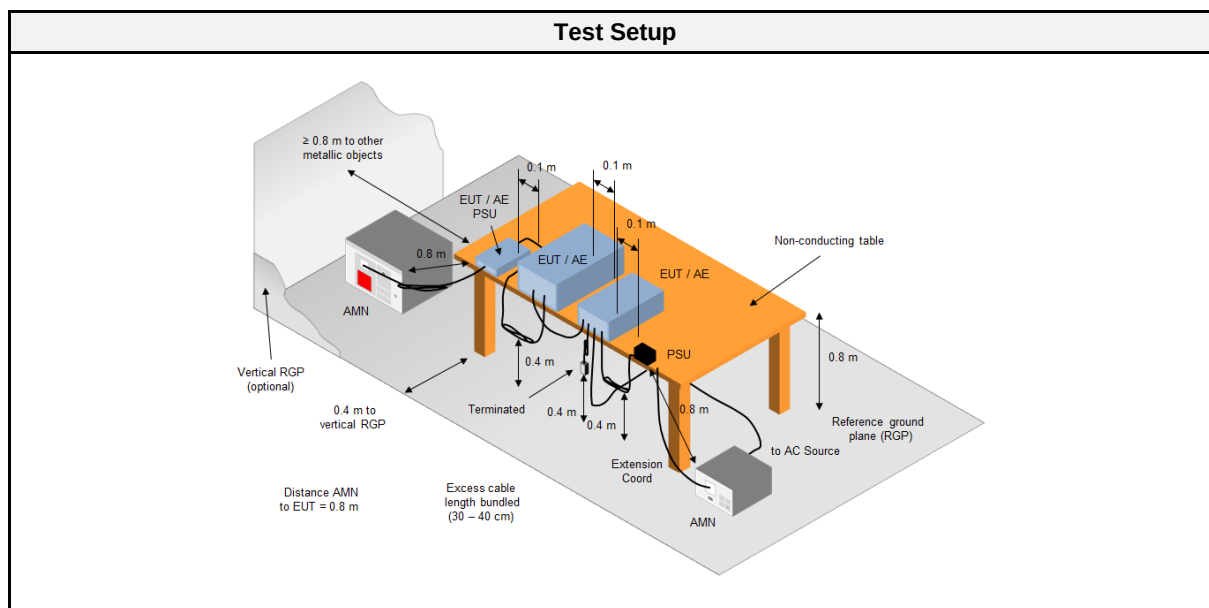
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	11.555 GHz	49.28 dBµV/m	53.98 dBµV/m	-4.7 dB	Pass	0 degrees	1 m
2	12.25 GHz	48.99 dBµV/m	53.98 dBµV/m	-4.99 dB	Pass	0 degrees	1 m

Test Report No.: G0M-2209-1690-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	R&S	ESH3-Z5	EF00036	2021-08	2023-08
Pulse Limiter	R&S	ESH3-Z2	EF01063	2021-07	2023-07
EMI Test Receiver	R&S	ESR 7	EF00943	2022-07	2023-07
Climatic Sensor	Embedded Data Systems, LLC.	2800100000254 17E	EF01054	2022-04	2023-04

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 0.15 – 30MHz 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

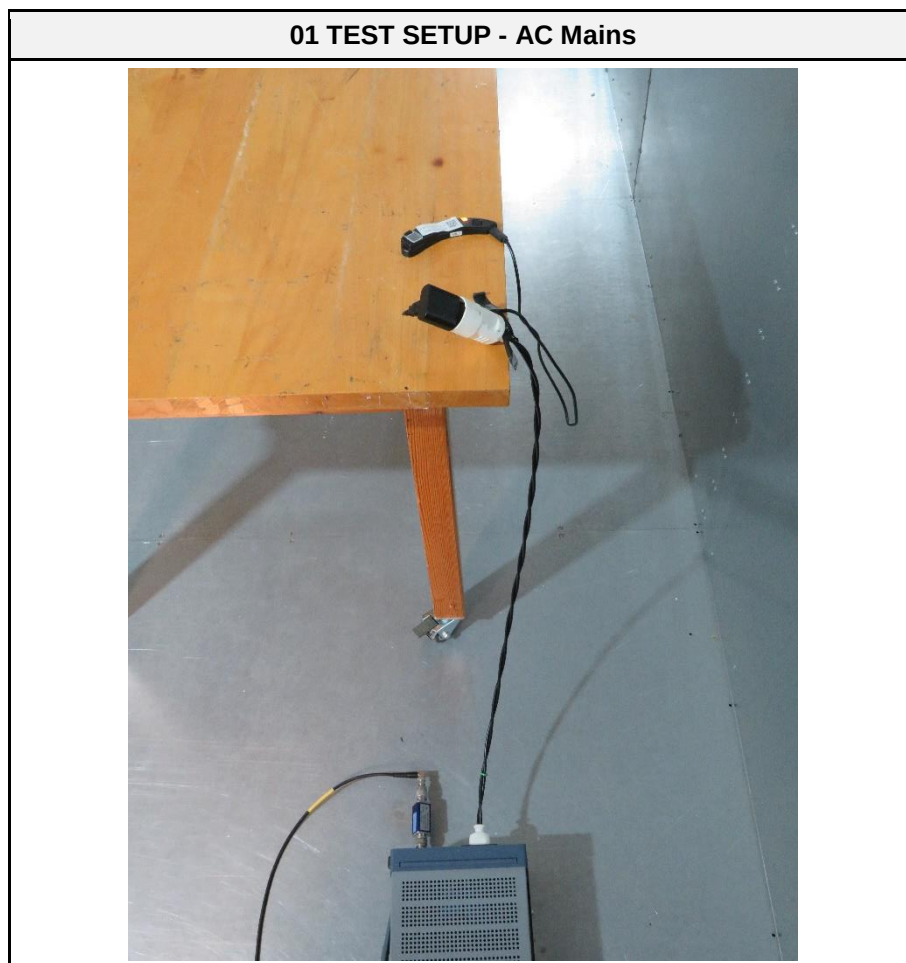
2.2.5 Limits

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
AC Mains	AMN	2	2	PASS	120 V AC / 60 Hz
Comment: AC Mains is port of the AC/DC-adapter					

2.2.7 Setup Photos



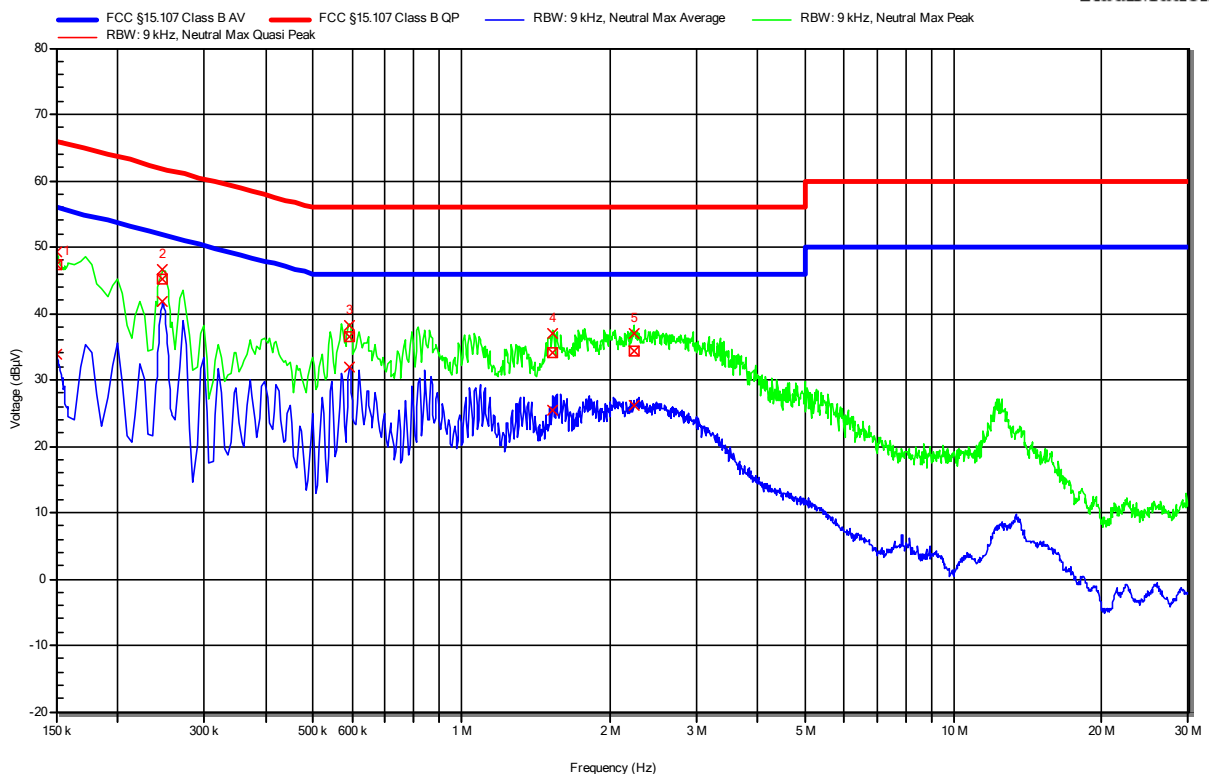
2.2.8 Records

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

Project Number:	G0M-2209-1690
Applicant:	digades GmbH
Model Description:	Head-up display for motorcycle helmets
Model:	TILSBERK Head-Up Display
Test Sample ID:	42438
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Date:	2023-02-17
Operating Conditions:	ambient temperature: 22 °Celsius power input: 5 V DC via USB connection and AC/DC-Adapter (120 V AC / 60 Hz)
LISN:	ESH3-Z5 (N)
Operational Mode:	2
EUT Configuration:	2
Applied to Port:	AC Mains
Note 1:	--

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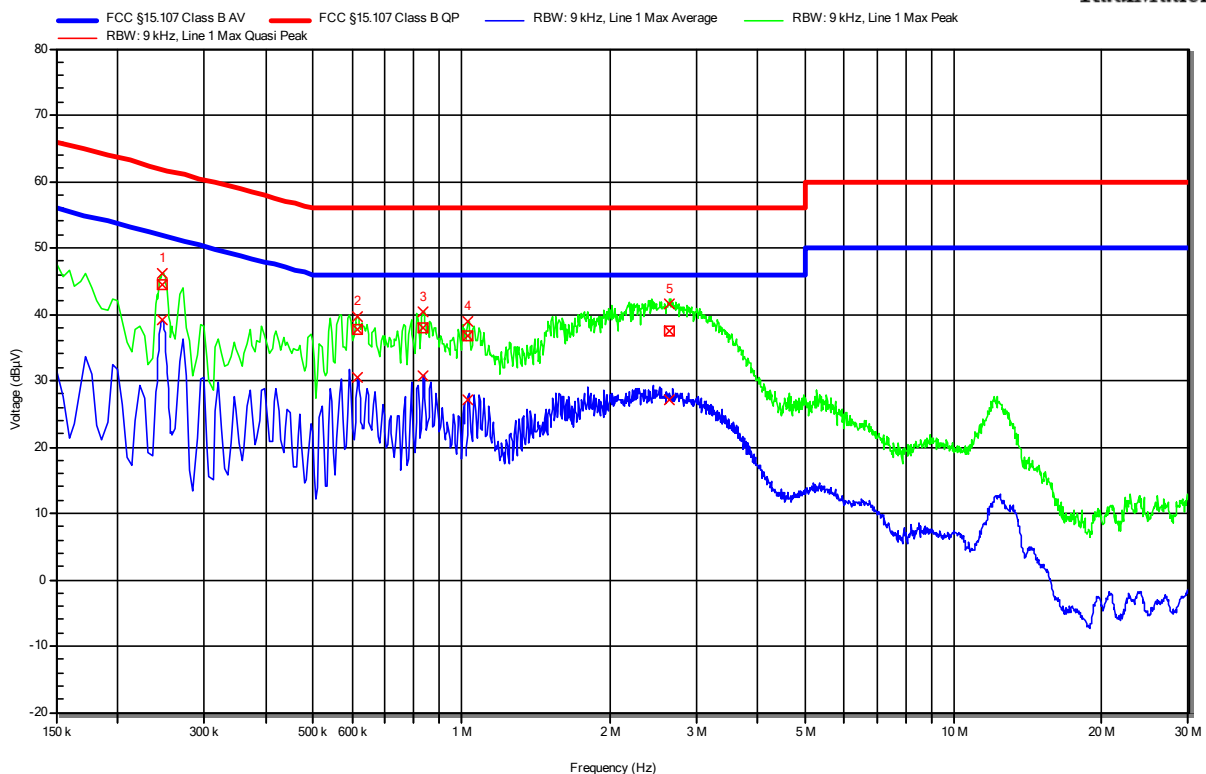
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	150 kHz	47.41 dBµV	66 dBµV	-18.59 dB	Pass	Neutral
2	247.2 kHz	45.23 dBµV	61.85 dBµV	-16.62 dB	Pass	Neutral
3	591.9 kHz	36.57 dBµV	56 dBµV	-19.43 dB	Pass	Neutral
4	1.527 MHz	34.2 dBµV	56 dBµV	-21.8 dB	Pass	Neutral
5	2.242 MHz	34.39 dBµV	56 dBµV	-21.61 dB	Pass	Neutral

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	150 kHz	33.86 dBµV	56 dBµV	-22.14 dB	Pass	Neutral
2	247.2 kHz	41.72 dBµV	51.85 dBµV	-10.13 dB	Pass	Neutral
3	591.9 kHz	31.93 dBµV	46 dBµV	-14.07 dB	Pass	Neutral
4	1.527 MHz	25.53 dBµV	46 dBµV	-20.47 dB	Pass	Neutral
5	2.242 MHz	26.14 dBµV	46 dBµV	-19.86 dB	Pass	Neutral

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

Project Number: G0M-2209-1690
 Applicant: digades GmbH
 Model Description: Head-up display for motorcycle helmets
 Model: TILSBERK Head-Up Display
 Test Sample ID: 42438
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2023-02-17
 Operating Conditions: ambient temperature: 22 °Celsius
 power input: 5 V DC via USB connection and AC/DC-Adapter (120 V AC / 60 Hz)
 LISN: ESH3-Z5 (L)
 Operational Mode: 2
 EUT Configuration: 2
 Applied to Port: AC Mains
 Note 1: --

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Radiation



Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	LISN
1	246.3 kHz	44.52 dBμV	61.88 dBμV	-17.36 dB	Pass	Line 1
2	615.75 kHz	37.64 dBμV	56 dBμV	-18.36 dB	Pass	Line 1
3	837.6 kHz	38.05 dBμV	56 dBμV	-17.95 dB	Pass	Line 1
4	1.033 MHz	36.63 dBμV	56 dBμV	-19.37 dB	Pass	Line 1
5	2.648 MHz	37.36 dBμV	56 dBμV	-18.64 dB	Pass	Line 1

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	LISN
1	246.3 kHz	39.06 dBμV	51.88 dBμV	-12.82 dB	Pass	Line 1
2	615.75 kHz	30.52 dBμV	46 dBμV	-15.48 dB	Pass	Line 1
3	837.6 kHz	30.62 dBμV	46 dBμV	-15.38 dB	Pass	Line 1
4	1.033 MHz	26.99 dBμV	46 dBμV	-19.01 dB	Pass	Line 1
5	2.648 MHz	27.19 dBμV	46 dBμV	-18.81 dB	Pass	Line 1

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	150kHz to 30MHz, 3.35dB
Radiated Emission	30MHz to 200MHz @ 3m, 5.1dB 200MHz to 1GHz @ 3m, 5.3dB >1GHz to 13GHz @3m, 5.95dB