

Test Report

Product	Handheld RFID reader with NFC, BLE module and battery charger		
Name and address of the applicant	BioControl AS Gautestadveien 75 1894 Rakkestad, Norway		
Name and address of the manufacturer	BioControl AS Gautestadveien 75 1894 Rakkestad, Norway		
Model	HHR5000LN, HHR5000SN		
Rating	Secondary Battery (7.4V, 2600mAh, Li-Ion)		
Trademark			
Serial number	See page 3		
Additional information	ISO reader, Bluetooth, RFID		
Tested according to	FCC Part 15B Unintentional Radiators Industry Canada ICES-003, Issue 7 Information Technology Equipment (including Digital Apparatus)		
Order number	405631		
Tested in period	2020-10-13 to 2020-10-23 and 2021-04-23 and 2021-09-07		
Issue date	2021-11-09		
Name and address of the testing laboratory	 Instituttveien 6 Kjeller, Norway www.nemko.com	CAB Number: FCC: NO0001 ISED: NO0470 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50	 
An accredited technical test executed under the Norwegian accreditation scheme			
 Prepared by [Frode Sveinsen]		 Approved by [G.Suhanthakumar]	
<p>This report shall not be reproduced except in full without the written approval of Nemko. Opinions and interpretations expressed within this report are not part of the current accreditation. This report was originally distributed electronically with digital signatures. For more information contact Nemko.</p>			

CONTENTS

1	INFORMATION	3
1.1	Test Item	3
1.2	Normal test condition.....	4
1.3	Test Engineer(s).....	4
1.4	EUT Operating Modes.....	4
1.5	Comments.....	4
2	TEST REPORT SUMMARY	5
2.1	General	5
2.2	Test Summary.....	6
3	TEST RESULTS.....	7
3.1	Power Line Conducted Emissions	7
3.2	Radiated Emission, 30 – 1000 MHz.....	8
3.3	Radiated Emissions, 1-18 GHz.....	12
4	Measurement Uncertainty.....	14
5	LIST OF TEST EQUIPMENT.....	15
6	BLOCK DIAGRAM.....	16
6.1	Power Line Conducted Emission	16
6.2	Test Site Radiated Emission.....	16

1 INFORMATION

1.1 Test Item

Name	BioControl
Model/version	HHR5000SN HHR5000LN
FCC ID	VW2-107378
ISED ID	7523A-107378
Serial number	2040-2 (HHR5000SN) 2040-7 (HHR5000LN) 2040-1 (HGC2)
Hardware identity and/or version	HHR5000 0.05, IsoModule 0.03, NFCReader 0.01, HandgripCharger 0.01
Software identity and/or version	HHR5000: 60.2, ISO_Module: 9.10, NFCReader: 6.6
Frequency Range	13.56 MHz
Number of Channels	1
Type of Modulation	ASK (30%)
Field Strength	64.1 dBµV/m @3m
Antenna Connector	None (Integral Antenna)
Number of Antennas	1
Antenna Type	Open Coil
Power Supply	Secondary Battery (Li-Ion, 7.4V, 2600mAh)
Conformance Class	Class A

Description of Test Item

The EUT is a RFID reader with NFC and ISO reader.

The EUT also contains a certified BLE Module from Ublox (FCC ID: XPYNINAB1; IC: 8595A-NINAB1).

The tested model was a HHR5000LN with LCD display and NFC reader, however the ISO reader is identical on all models.

Model Comparison

Feature	HHR5000S	HHR5000L	HHR5000SN	HHR5000LN
LCD	No	Yes	No	Yes
Smartphone holder	Yes	No	Yes	No
ISO Reader	Yes	Yes	Yes	Yes
NFC Reader	No	No	Yes	Yes
BLE Module	Yes	Yes	Yes	Yes
HandGrip Charger	HGC2			
FCC ID	VW2-107377		VW2-107378	
IC	7523A-107377		7523A-107378	

1.2 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	7.4 V DC

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Frode Sveinsen

1.4 EUT Operating Modes

Description of operating modes	Continuous TX
Additional information	The EUT was programmed to transmit continuously from the LCD Interface by using a special test software. It was only possible to select the transmit frequency, no power or modulation settings were available.

1.5 Comments

The EUT is a RFID reader with 13.56 MHz NFC reader and 131 / 134 kHz ISO reader.

The EUT also contains a certified BLE Module.

All measurements were done with the EUT powered by a fully charged battery, or with the EUT Charging.

2 TEST REPORT SUMMARY

2.1 General

All measurements are traceable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 15B and ISED Canada ICES-003 Issue 7.

Tests were performed in accordance with ANSI C63.4-2014.

Radiated tests were made in a semi-anechoic chamber at measuring distance of 3m or 10m.

A description of the test facility is on file with FCC and ISED.

New Submission

Production Unit

Class II Permissive Change

Pre-production Unit

JAD Equipment Code

Family Listing



THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

Nemko Group authorizes the above named entity to reproduce this report provided it is reproduced in its entirety and for use by the entity's employees only. Any reproduction of parts of this report requires approval in writing from Nemko Group.

Any use that a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Group accepts no responsibility for damages suffered by any third party caused by decisions made or actions based on this report.

2.2 Test Summary

Name of test	FCC Part 15B reference	ICES-003 Issue 7 RSS-GEN Issue 5 reference	ANSI C63.04-2014 Reference	Result
Power Line Conducted Emission	15.107	3.2.1 (ICES-003) 8.8 (RSS-GEN)	7.3	Complies
Spurious Emissions (Radiated)	15.109(b)	3.2.2 (ICES-003) 8.9 (RSS-GEN)	8.3	Complies

Revision history

Revision	Date	Comment	Sign
00	2021-03-15	First edition	FS
01	2021-03-25	Corrected version	FS
02	2021-04-23	Updated Conducted results	FS
03	2021-11-09	Added instruments for conducted tests and corrected typos	Fs

3 TEST RESULTS

3.1 Power Line Conducted Emissions

FCC Part 15.107

ISED ICES-003 Issue 7, clause 3.2.1

Measurement procedure: ANSI C63.4-2014 using 50 μ H/50 ohms LISN.

Test Results: Complies with Class A limits

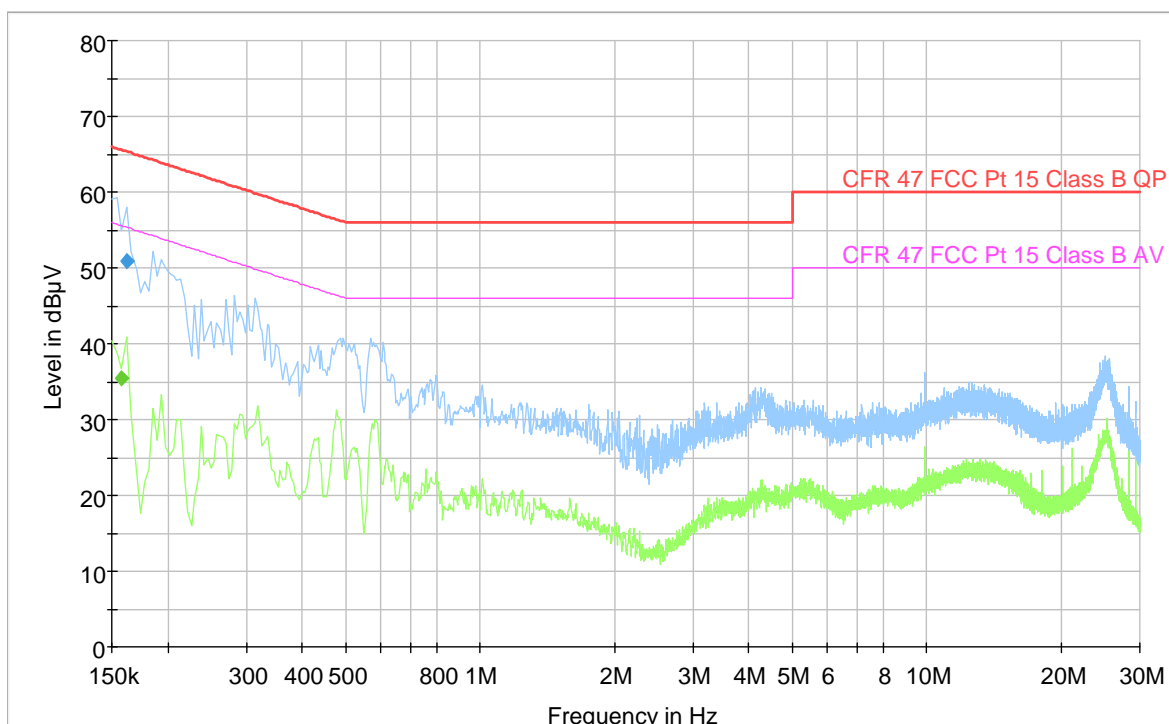
Measurement Data: See attached plots.
 NFC is deactivated when the charger is connected.

Highest measured value (L1 and N):

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter
0.158	---	35.45	55.57	20.12	1000	9	N	OFF
0.162	50.84	---	65.36	14.52	1000	9	N	OFF

Charging, 120V 60Hz

Full Spectrum



3.2 Radiated Emission, 30 – 1000 MHz.

FCC Part 15.109 (b)

ISED Canada ICES-003 Issue 7, Clause 3.2.2

Measurement procedure: ANSI C63.4-2014 Clause 8.3

Test Results: Complies

Measurement Data:

Measuring distance 3m

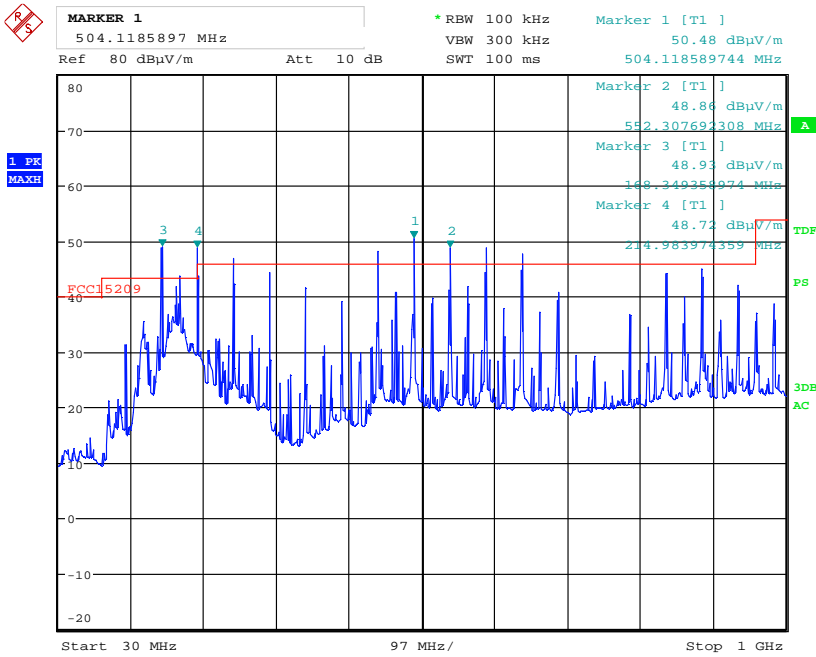
This is a Class A device.

Frequency (MHz)	Distance (m)	Polarization	Detector	Field Strength (dB μ V/m @3m)	Class A Limit (dB μ V/m @3m)	Margin (dB)
192.975	3	H	QP	42.3	54.0	11.7
216	3	H	QP	42.2	54.0	11.8
360	3	H	QP	48.1	56.9	8.8
408	3	H	QP	45.9	56.9	11.0
504	3	H	QP	39.7	56.9	7.2

See attached plots.

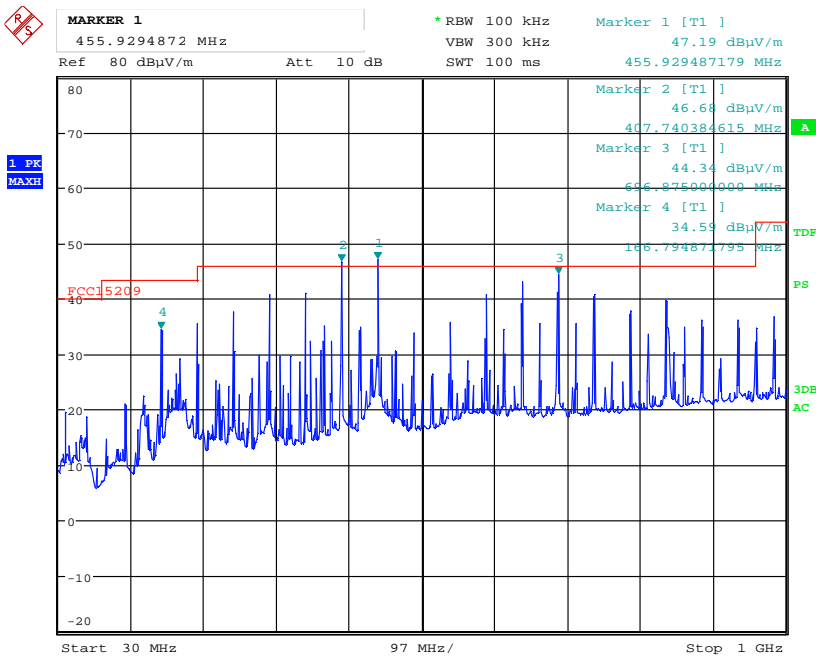
Requirements/Limit

FCC	Part 15.109
ISED	ICES-003, clause 3.2.2
Frequency	Class A, Radiated emission limit @3 meters
30 – 88 MHz	49.5 dB μ V/m
88 – 216 MHz	54.0 dB μ V/m
216 – 960 MHz	56.9 dB μ V/m
960 – 1000 MHz	60.0 dB μ V/m
	Limits above are with Quasi Peak Detector



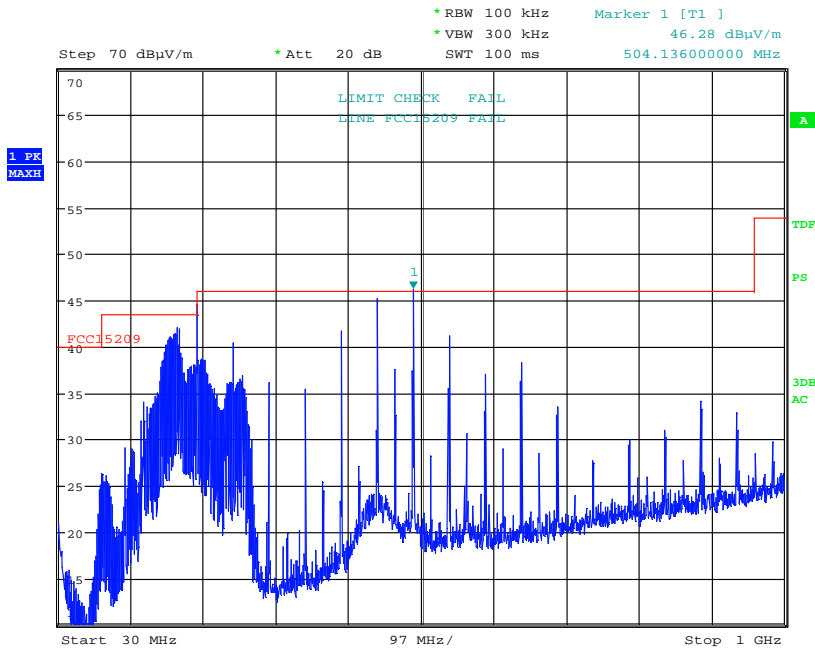
Date: 15.OCT.2020 11:08:23

Radiated Emissions 30 - 1000 MHz, HP @3m



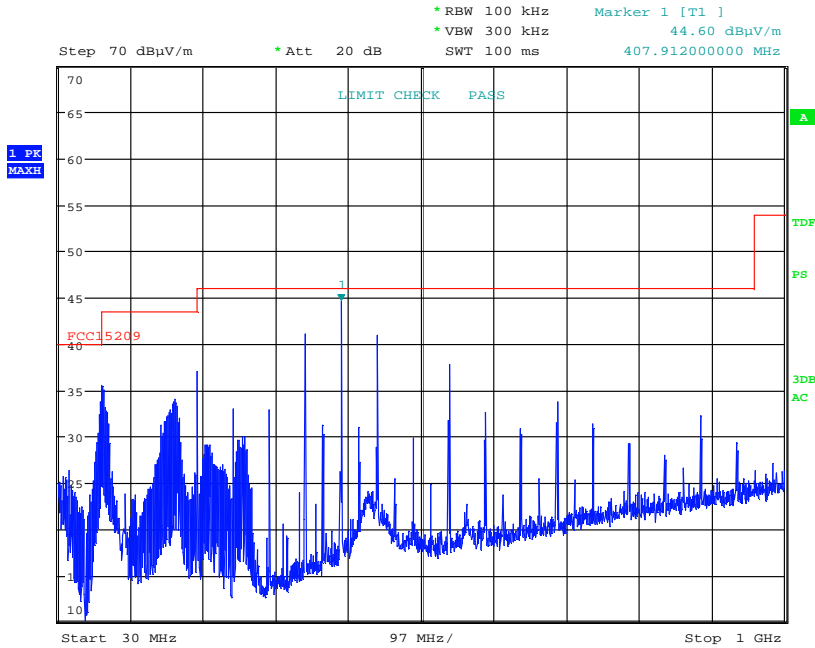
Date: 15.OCT.2020 11:12:07

Radiated Emissions 30 - 1000 MHz, VP @3m



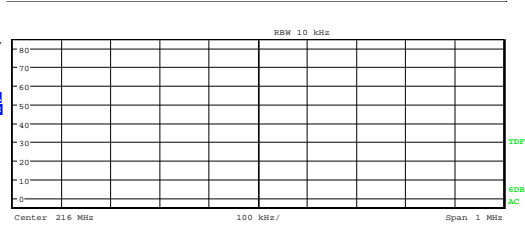
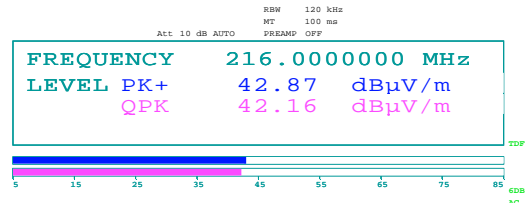
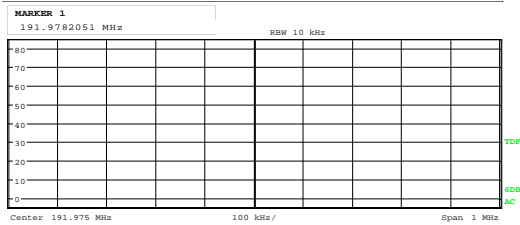
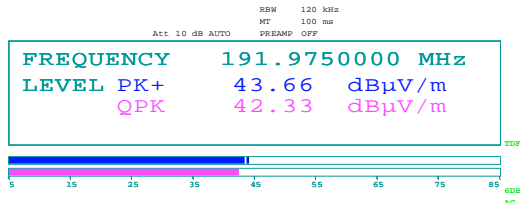
Date: 7.SEP.2021 14:36:26

Radiated Emissions 30 - 1000 MHz, HP @3m, EUT Charging 120V 60Hz



Date: 7.SEP.2021 14:34:29

Radiated Emissions 30 - 1000 MHz, VP @3m, EUT Charging 120V 60Hz

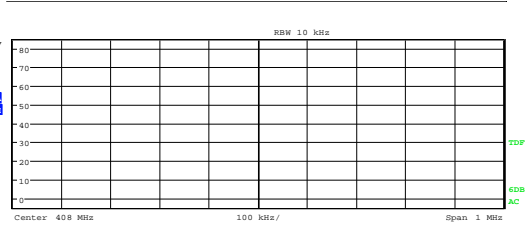
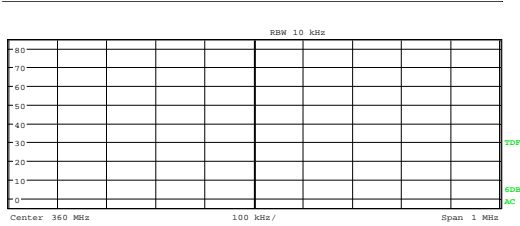
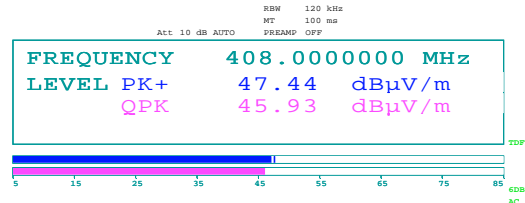
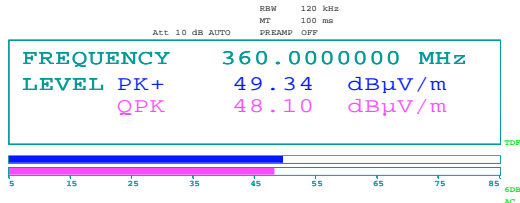


Date: 7.SEP.2021 15:47:55

Date: 7.SEP.2021 15:49:25

Radiated Emissions 192.975 MHz, HP, @3m, EUT Charging

Radiated Emissions 216 MHz, HP, @3m, EUT Charging

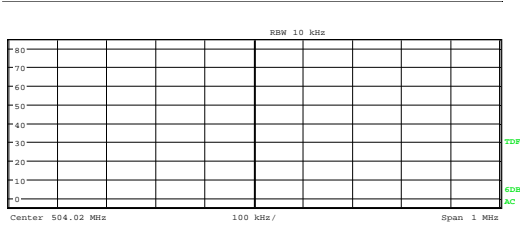
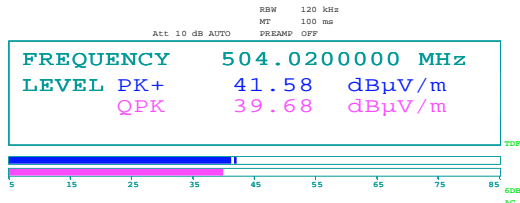


Date: 7.SEP.2021 15:35:45

Date: 7.SEP.2021 15:23:43

Radiated Emissions 360 MHz, HP, @3m, EUT Charging

Radiated Emissions 408 MHz, HP, @3m, EUT Charging



Date: 7.SEP.2021 15:51:35

Radiated Emissions 504 MHz, HP, @3m, EUT Charging

3.3 Radiated Emissions, 1-18 GHz

FCC Part 15.109 (b)

ISED Canada ICES-003 Issue 7, Clause 3.2.2

Measurement procedure: ANSI C63.4-2014 Clause 8.3

Test Results: Complies

Measurement Data:

Measuring distance: 3m (1 – 18 GHz)

No emissions were detected. See plots.

Tested with BT active.

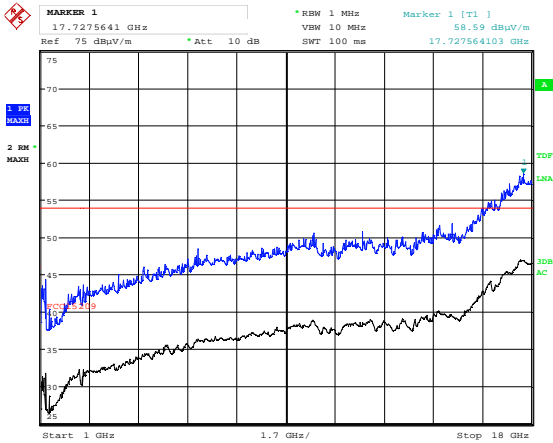
A Band Reject Filter for the 2.4GHz band was used for measurements from 1 GHz to 18 GHz.

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor"

See plots.

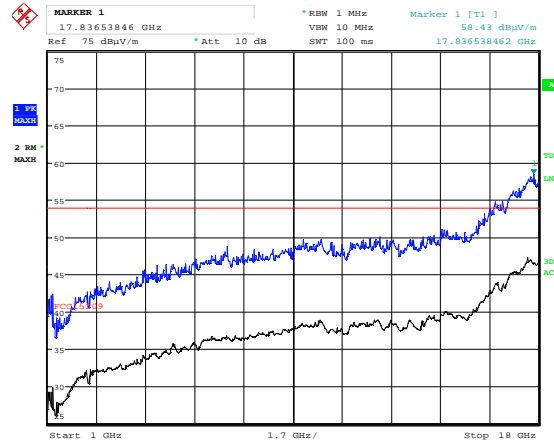
Requirements/Limit

FCC	Part 15.109 (b) Class A Limits	
ISED	ICES-003 Issue 7, clause 3.2.2, Class A limits	
	Radiated emission limit @3 meters	
Frequency	Average Detector	Peak Detector
Above 1 GHz	60.0 dBµV/m	80.0 dBµV/m



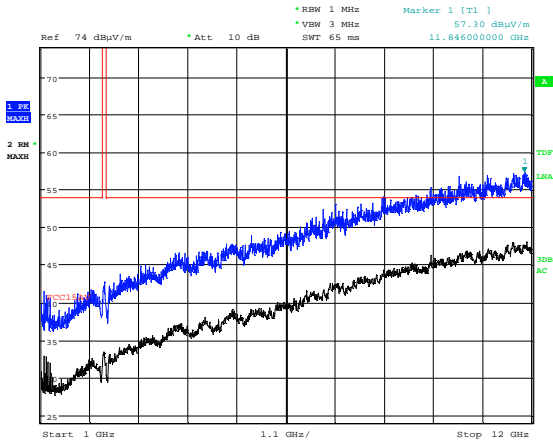
Date: 15.OCT.2020 11:36:25

Radiated Emissions 1 - 18 GHz, HP @3m



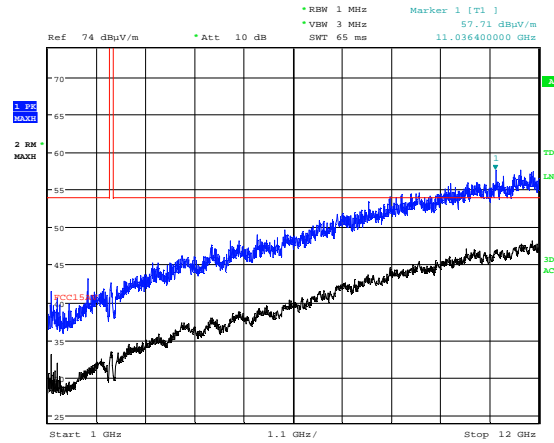
Date: 15.OCT.2020 11:31:59

Radiated Emissions 1 - 18 GHz, 2402 MHz, VP @3m



Date: 7.SEP.2021 16:18:17

Radiated Emissions 1 - 12 GHz, HP @3m, EUT Charging



Date: 7.SEP.2021 16:16:04

Radiated Emissions 1 - 12 GHz, VP @3m, EUT Charging

4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSU26	Spectrum Analyzer	Rohde & Schwarz	LR 1504	2020-01	2022-01
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2020-01 2021-02	2021-01 2022-02
3	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 1660	2019-06	2022.06
4	6502	Active Loop	EMCO	N 3488	N/A	
5	VULB 9163	BiLog Antenna	Schwarzbech	LR 1616	2020-01	2023-01
6	317	Preamplifier	Sonoma Inst.	LR 1687	2020-07 2021-08	2021-07 2022-08
7	3117-PA	Horn Antenna with PA	EMCO	LR 1717	2018-12 2021-08	2021-12 2022-08
8	RG223	RF Cables	Suhner	N/A	COU	
9	ENV216	LISN	Rohde & Schwarz	LR 1665	2019-11	2021-11
10	ESCI3	EMI Receiver	Rohde & Schwarz	N 4259	2019-10	2021-10

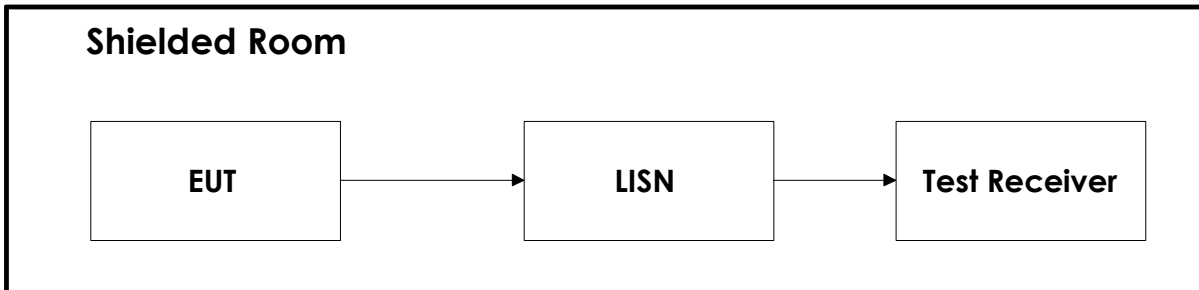
COU = Calibrate on Use

The software listed below has been used for one or more tests.

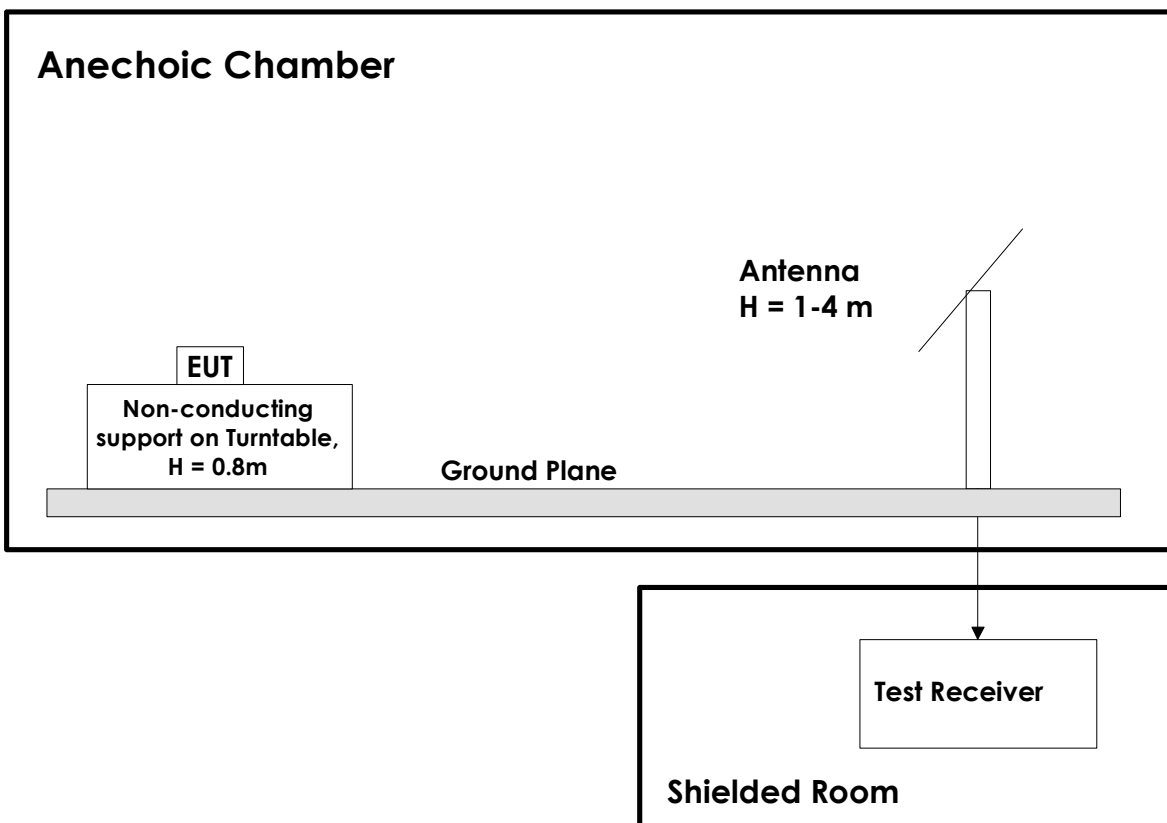
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.30.10	Power Line Conducted test software
2	Rohde & Schwarz	EMC32	10.30.10	Radiated Emission test software
3	Nemko AS	RSPlot	1.0.1.0	Screenshots from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. For all frequencies above 30 MHz test distance is 3m or 1m. Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss. All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers. A pre-amplifier is used for all measurements above 30 MHz, and High-Pass or Band-Pass filter is used for all harmonics.