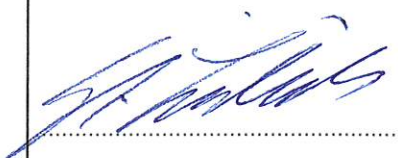


EMC TEST REPORT	
FCC 47 CFR Part 15B, ISED ICES-003 Issue 7	
Report Reference No	G0M-2104-9736-EF0115B-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation	 A2LA - Registration number: 1983.01 (ISED) ISED wireless device testing laboratory: CN 3470A FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant	ANDREAS STIHL AG & Co. KG
Address	Andreas-Stihl-Straße 4 71336 Waiblingen GERMANY
Test Specification Standard(s)	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	STIHL Smart Connector 2 A / STIHL Part No. CA01-400-4900-A
Model(s)	SC2A
Additional Model(s)	None
Brand Name(s)	STIHL
Hardware Version(s)	01.00
Software Version(s)	01.16
FCC-ID	2ALP8SC2A
IC	23431-SC2A
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	2021-05-20	
Report:		
Compiled by	Stephan Liebich	
Tested by (+ signature) (Responsible for Test)	Stephan Liebich	
Approved by (+ signature) (Test Lab Technician)	Matthias Handrik	
Date of Issue	2021-07-19	
Total number of pages	27	
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:		
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	2021-07-19	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.....	10
1.4	Support Equipment.....	14
1.5	Operational Modes.....	14
1.6	EUT Configuration.....	14
1.7	Sample emission level calculation.....	15
2	Result Summary.....	16
2.1	Test Conditions and Results - Radiated emissions acc. to ANSI C63.4.....	17

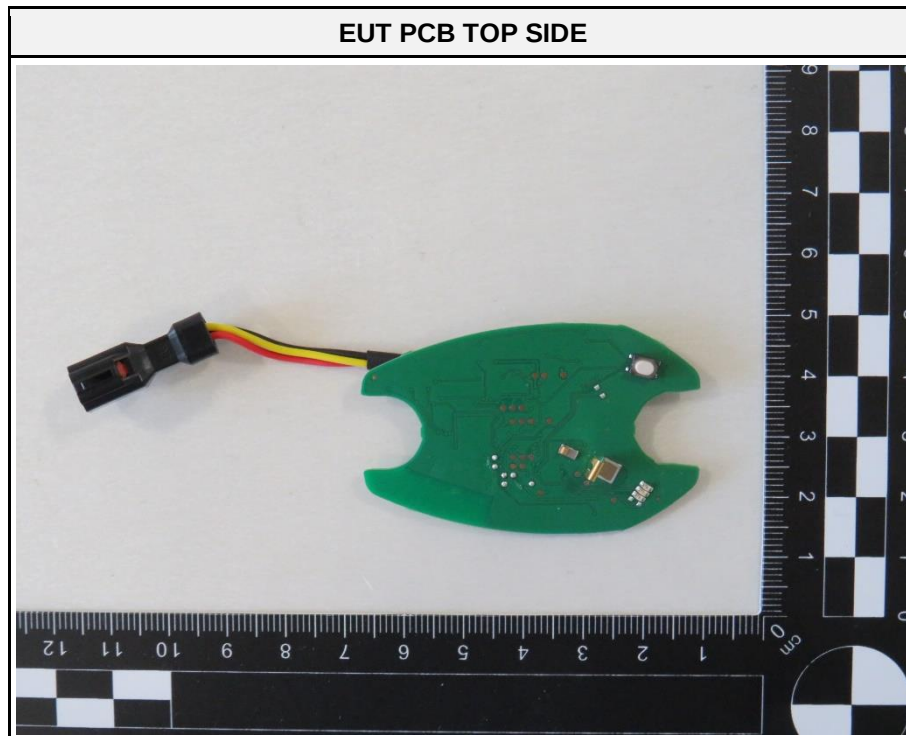
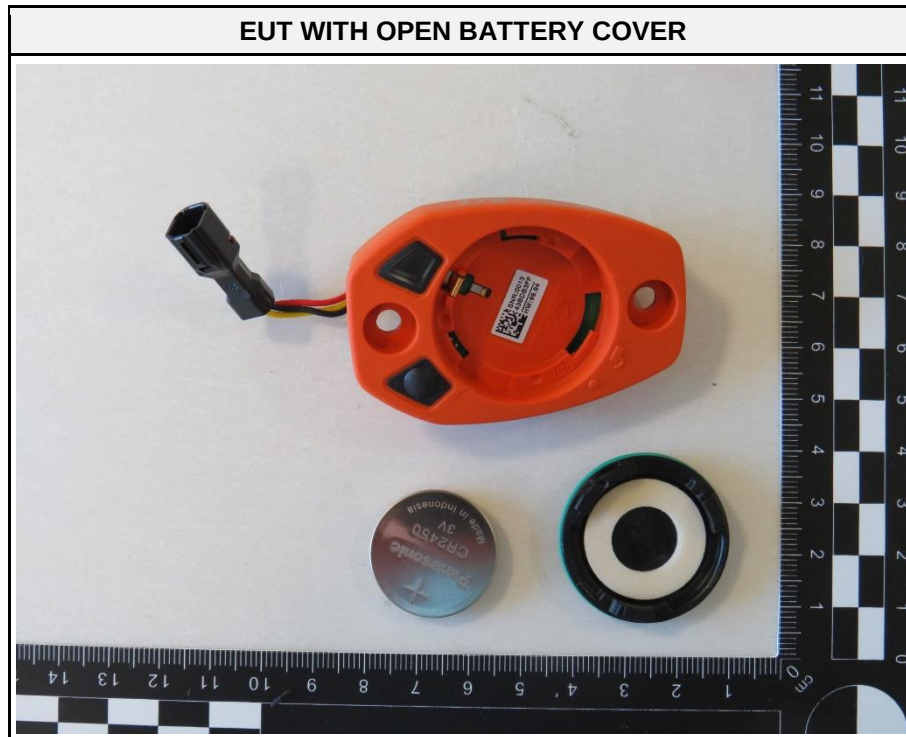
1 Equipment (Test Item) Under Test

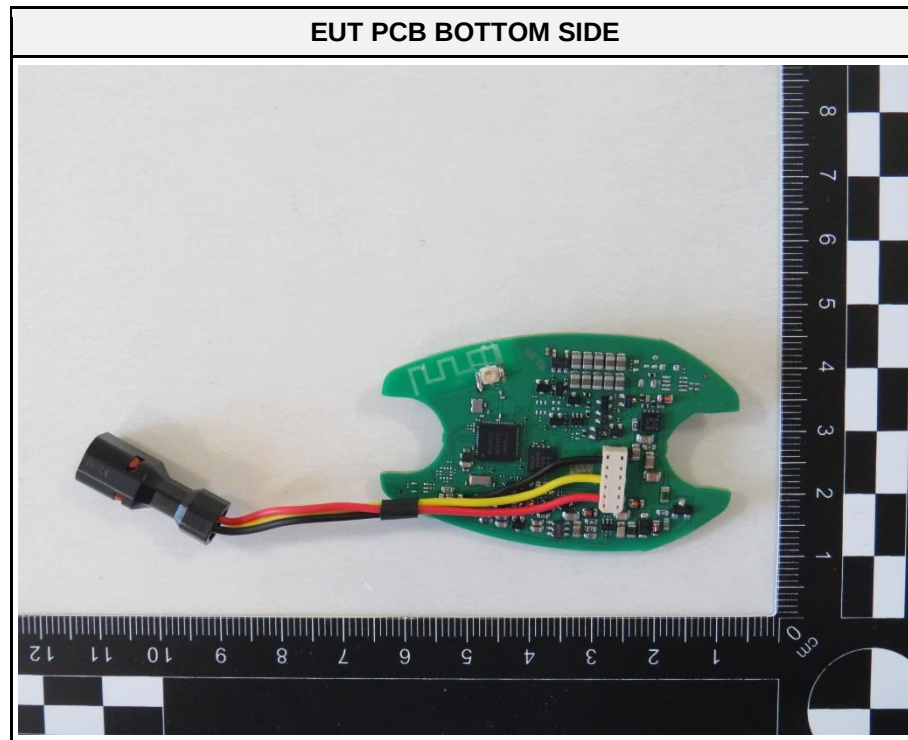
Description	STIHL Smart Connector 2 A / STIHL Part No. CA01-400-4900-A	
Model	SC2A	
Additional Model(s)	None	
Brand Name(s)	STIHL	
Serial Number(s)	0013 43BDB3FF	
Sample-ID	34803	
Hardware Version(s)	01.00	
Software Version(s)	01.16	
EUT Dimensions [cm]	6.1 x 4.2 x 1.4	
FCC-ID	2ALP8SC2A	
IC	23431-SC2A	
Class	Class B	
Equipment type	Table top	
Highest internal frequency [MHz]	2400 (Bluetooth) 16 (Clock frequency)	
Radio Module	Type	Bluetooth Low Energy (LE) 4.2
	Model	unspecified
	Manufacturer	unspecified
	FCC-ID	N/A
	IC	N/A
Supply Voltage	V _{NOM}	3 V DC by internal none-rechargeable battery (Manganese Dioxide Lithium CR-2450) 36 V DC by internal power supply provided by STIHL Power Tool
Manufacturer	ANDREAS STIHL AG & Co. KG Andreas-Stihl-Straße 4 71336 Waiblingen GERMANY	

1.1 Equipment Ports

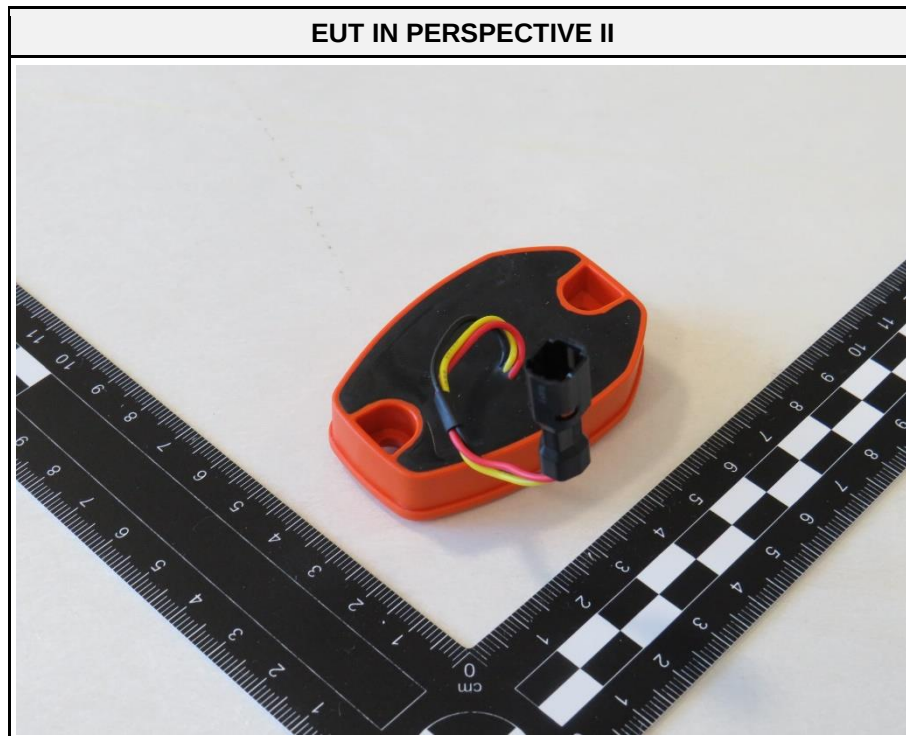
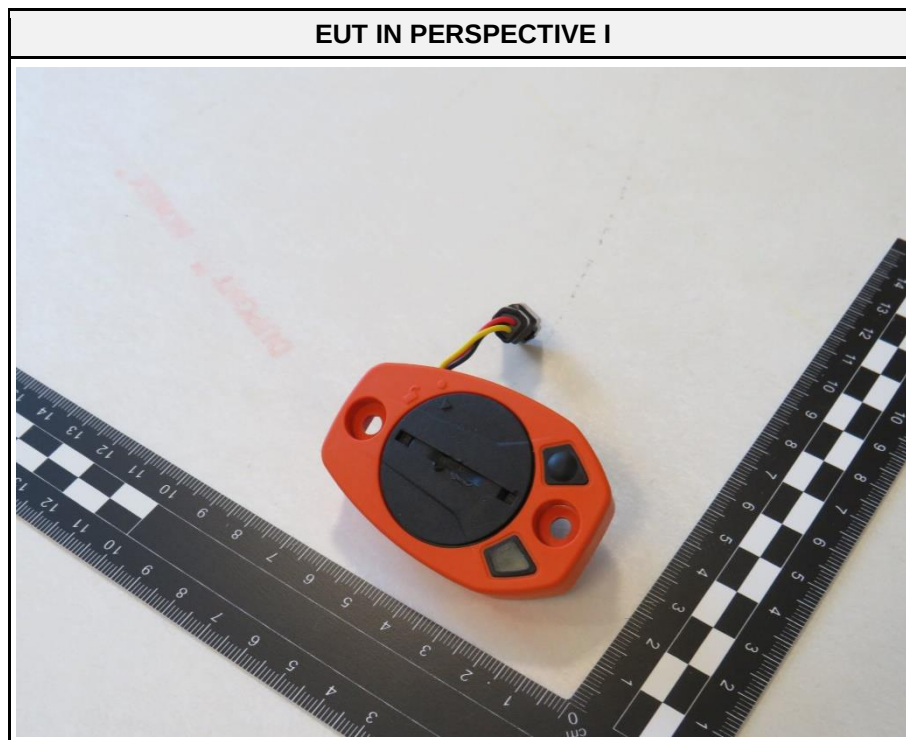
Name	Type	Attributes	Comment
MULTIPOINT	BAT;IO	Count: 1 Direction: In Service only: No	MULTIPOINT has three lines: 1. power supply provided by STIHL Power Tool via Line: VDD and GND 2. Companion Device runtime data via Line: COM and GND
Description:			
AC	AC mains power input/output port		
DC	DC power input/output port		
BAT	DC power input port connected to external battery		
IO	Input/Output port		
TP	Telecommunication port		
NE	Non-electrical port		

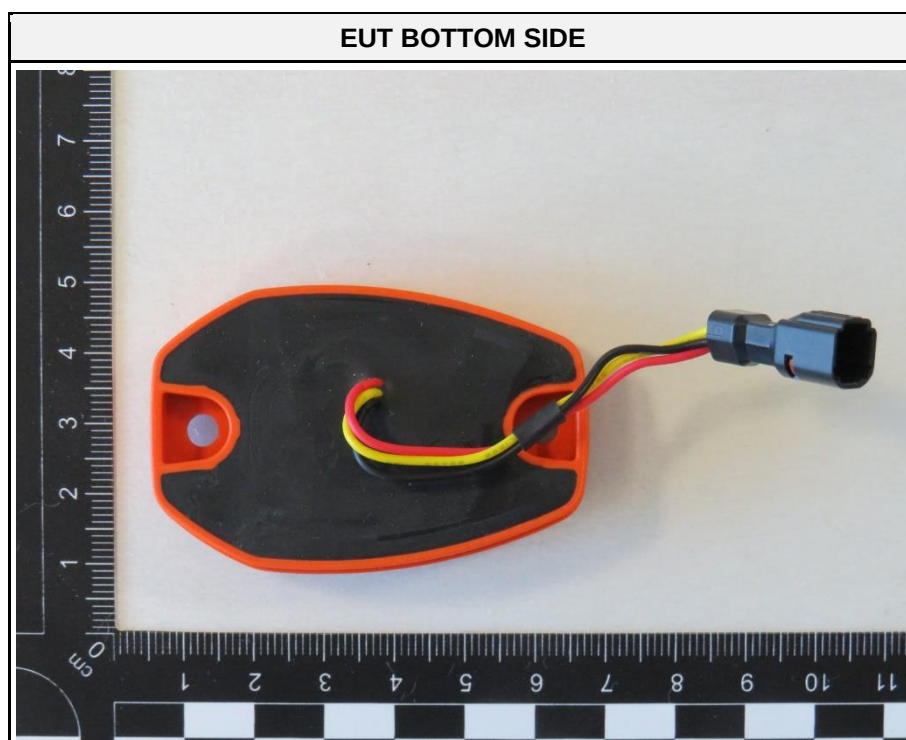
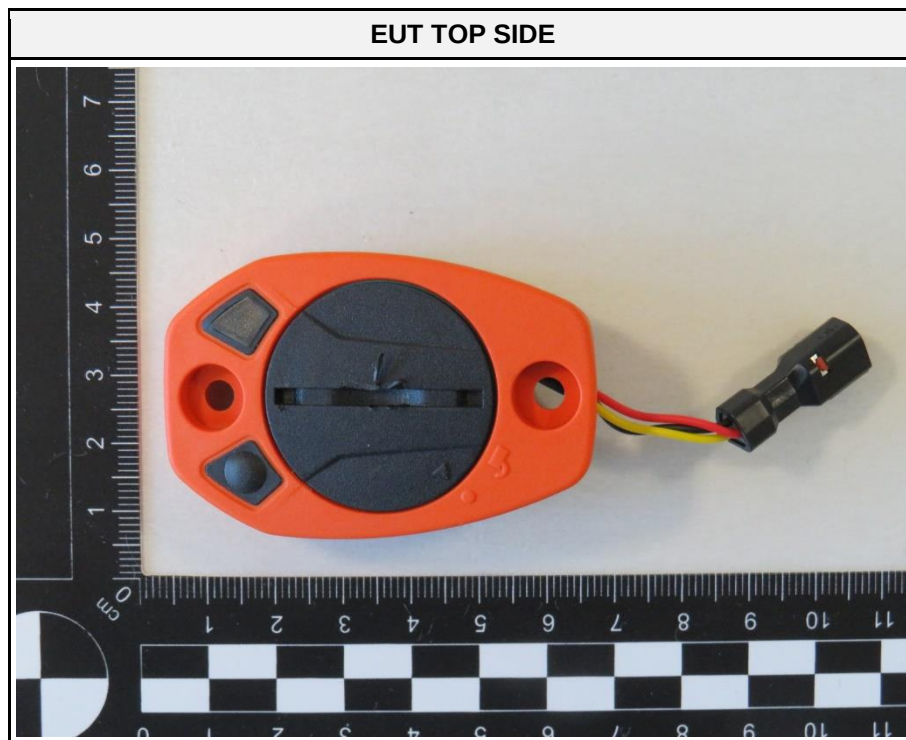
1.2 Equipment Photos - Internal



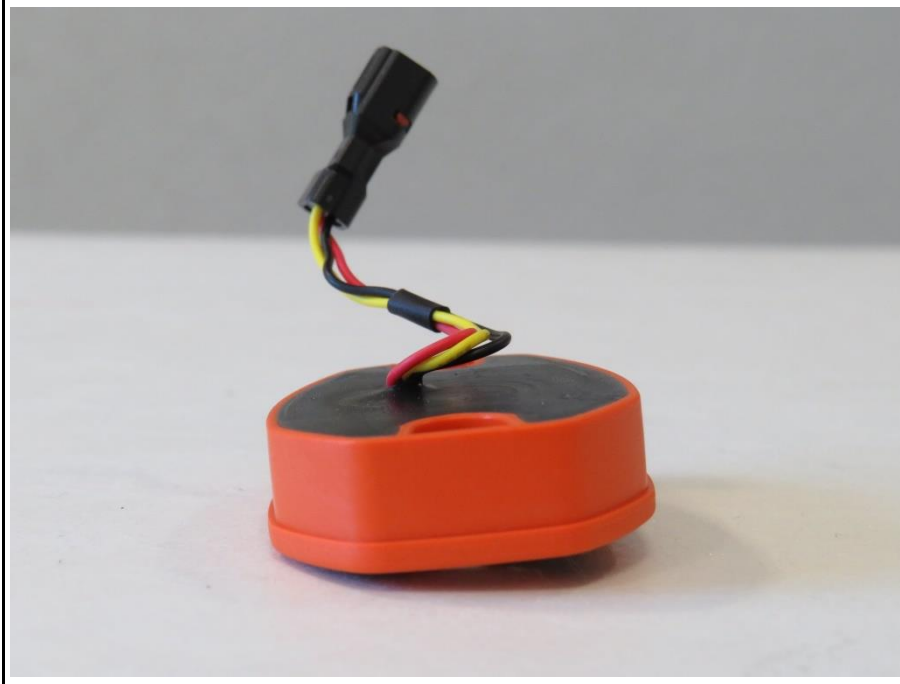


1.3 Equipment Photos - External

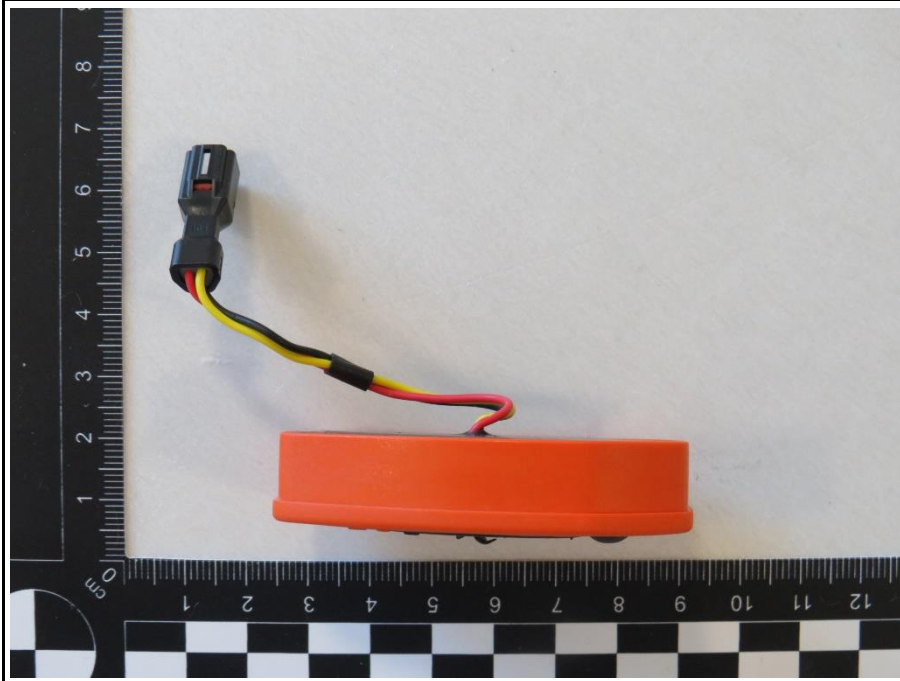




EUT FRONT SIDE



EUT LEFT SIDE



EUT REAR SIDE



EUT, AE AND COMPANION DEVICE IN PERSPECTIVE



1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Load	STIHL	STIHL FSA 135 R	--
AE	Battery Pack	STIHL	AP 500 S	--
AE/MON	Smartphone	Apple Inc.	iPhone SE	Companion Device for Bluetooth connection
SW	Test App	STIHL	SC2A Test App	
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
MON	Monitoring Equipment			
CBL	Connecting Cable			
SW	Software			
Comment: --				

1.5 Operational Modes

Mode #	Description
1	EUT receives runtime data from STIHL FSA 135 R via Multiport and transmits data to Smartphone via Bluetooth LE 4.2 connection
Comment: --	

1.6 EUT Configuration

Configuration #	Description
1	EUT is powered by STIHL FSA 135 R (36 V). STIHL FSA 135 R is powered by Battery Pack (36 V). Engine of STIHL FSA 135 R is running. Additional in the EUT is a 3 V DC none-rechargeable Manganese Dioxide Lithium CR 2450 support battery inserted.
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

FCC 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	No relevant port
Comment:				

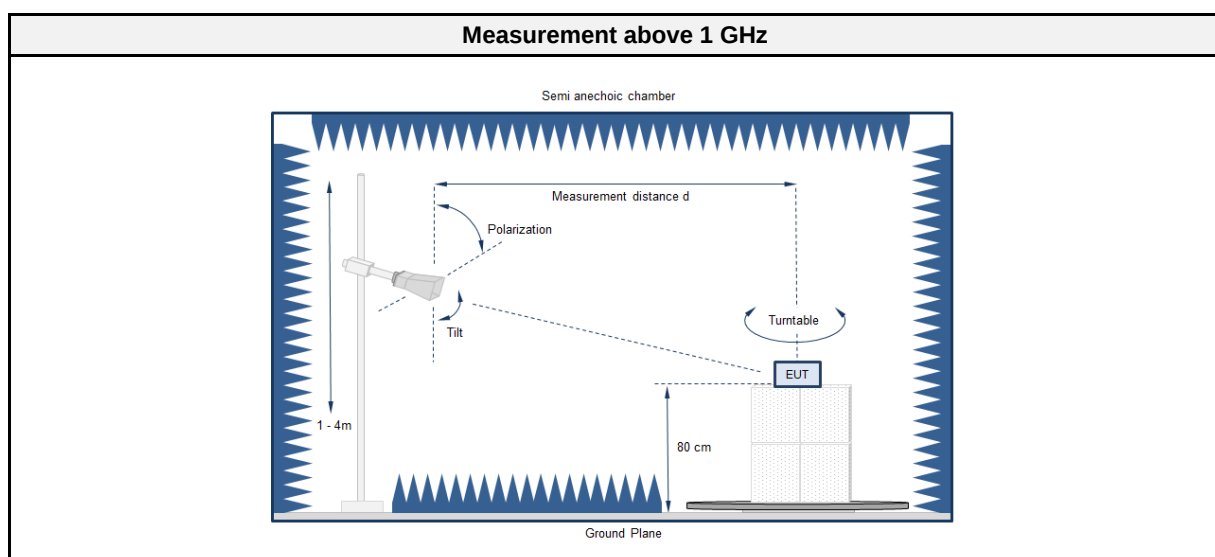
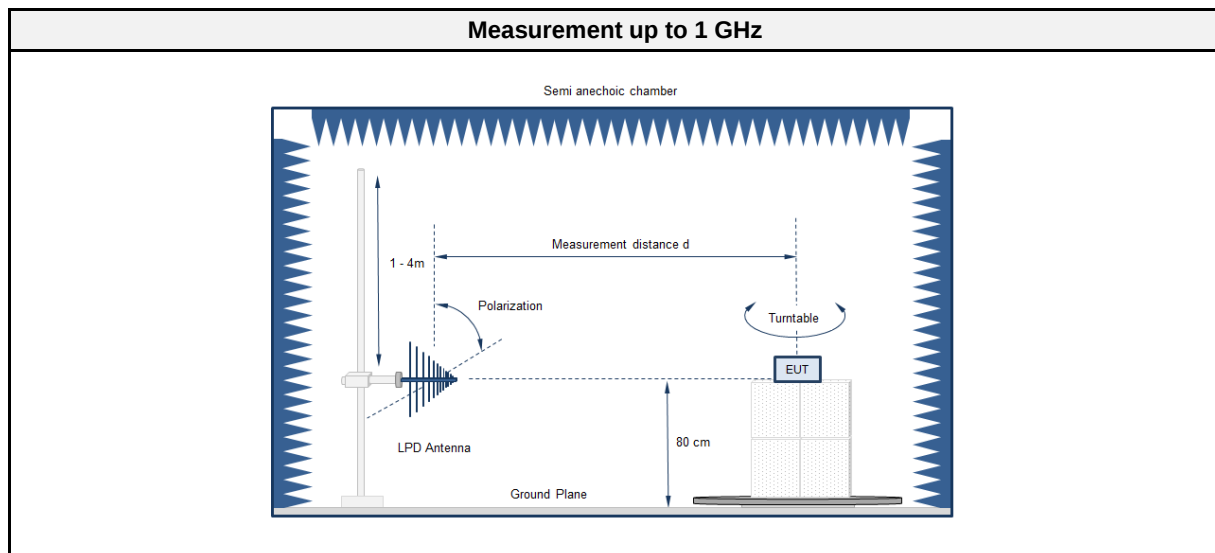
Possible Test Case Verdicts	
PASS	Test object does meet the requirements
FAIL	Test object does not meet the requirements
N/T	Required by standard but not tested
N/R	Not required by standard for the test object

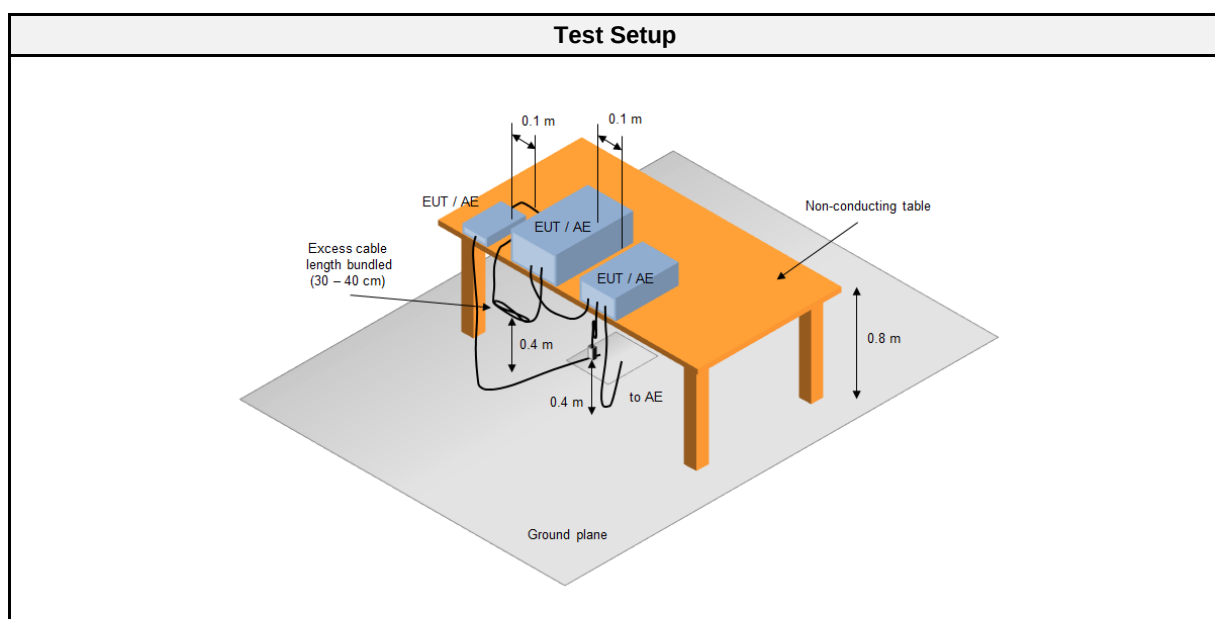
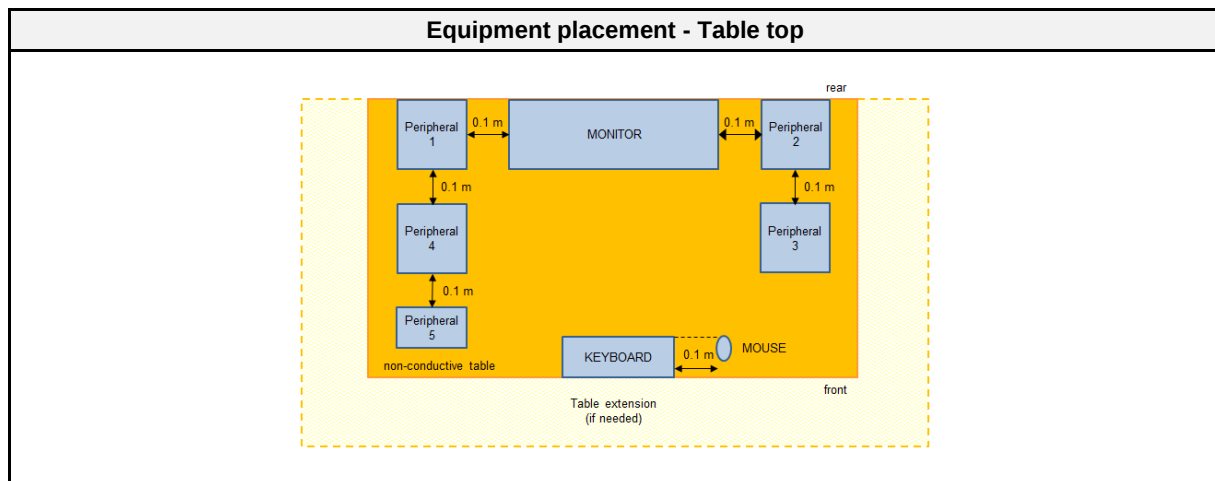
2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

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]	2400
Measurement range	30 MHz to 13000 MHz
Temperature [°C]	19 – 23
Humidity [%]	43 – 49
Operator	Stephan Liebich
Date	2021-06-02

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	AC1	EF00062	2021-02	2024-02
EMI Test Receiver	Keysight	N9038A-526/WXP	EF01070	2020-06	2021-06
Biconical Antenna	R&S	HK 116	EF00030	2019-04	2022-04
LPD Antenna	R&S	HL 223	EF00187	2019-05	2022-05
Horn Antenna	Schwarzbeck	BBHA9120D	EF00018	2019-10	2022-10
Climatic Sensor	Embedded Data Systems, LLC.	2800100000254 17E	EF01054	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.

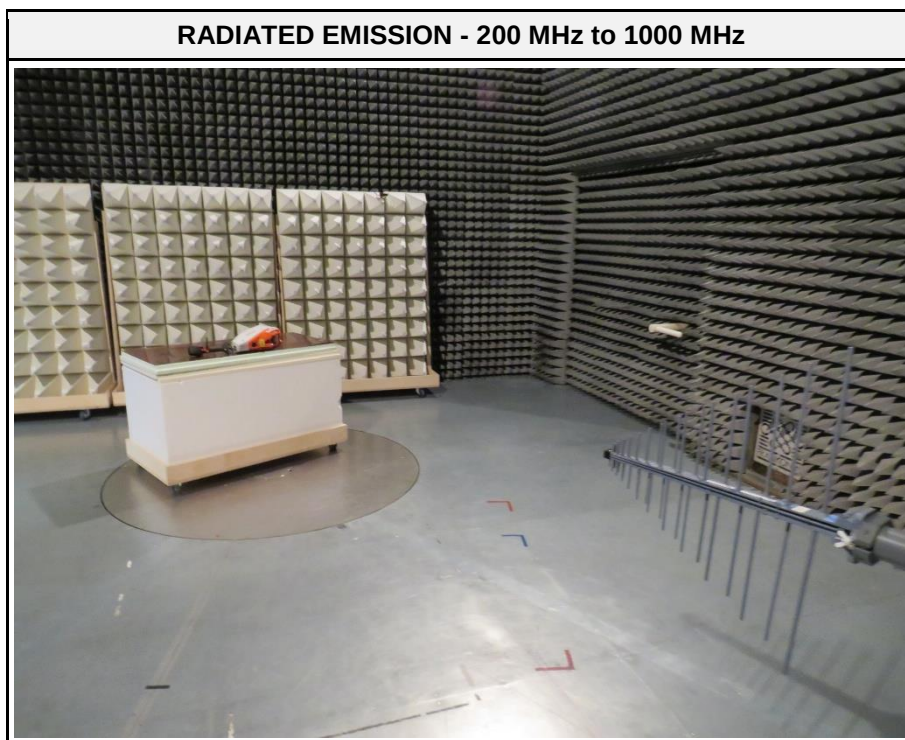
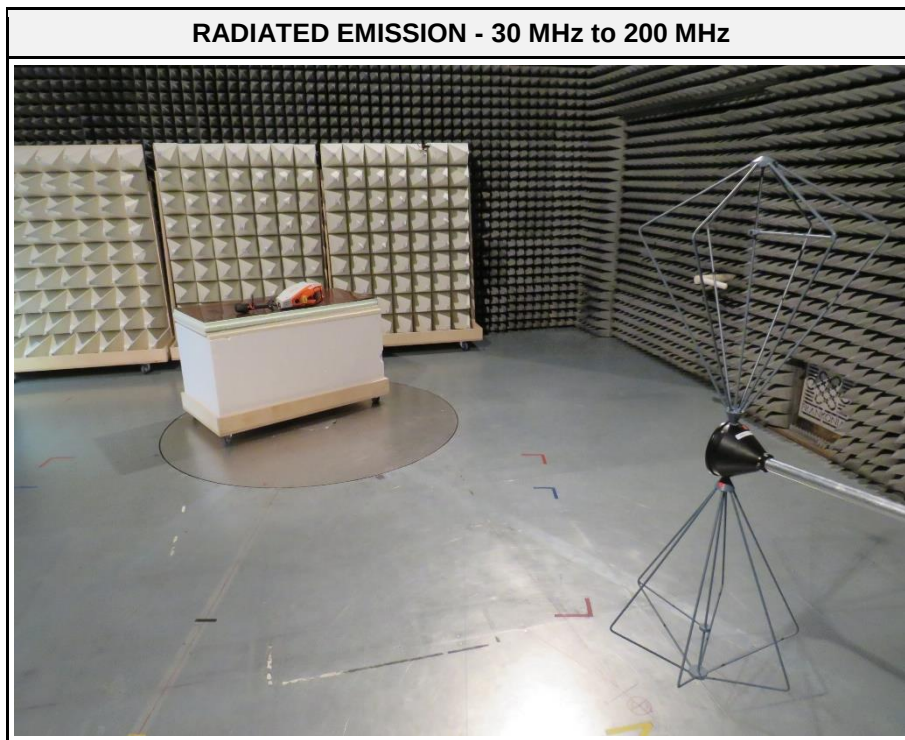
2.1.5 Limits

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

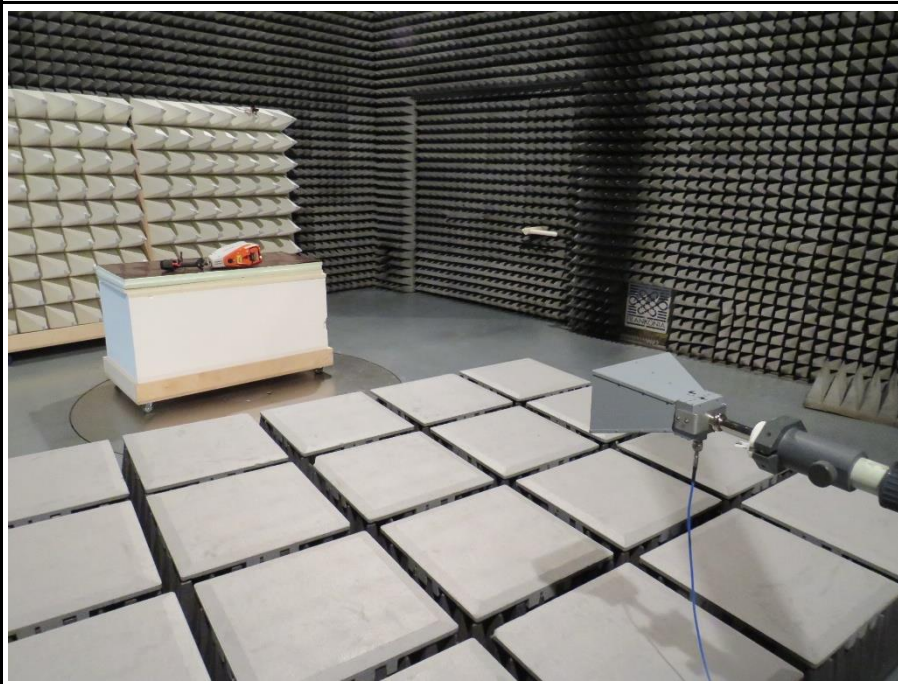
2.1.6 Results

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

2.1.7 Setup Photos



RADIATED EMISSION - 1000 MHz to 13000 MHz



RADIATED EMISSION - FOCUS



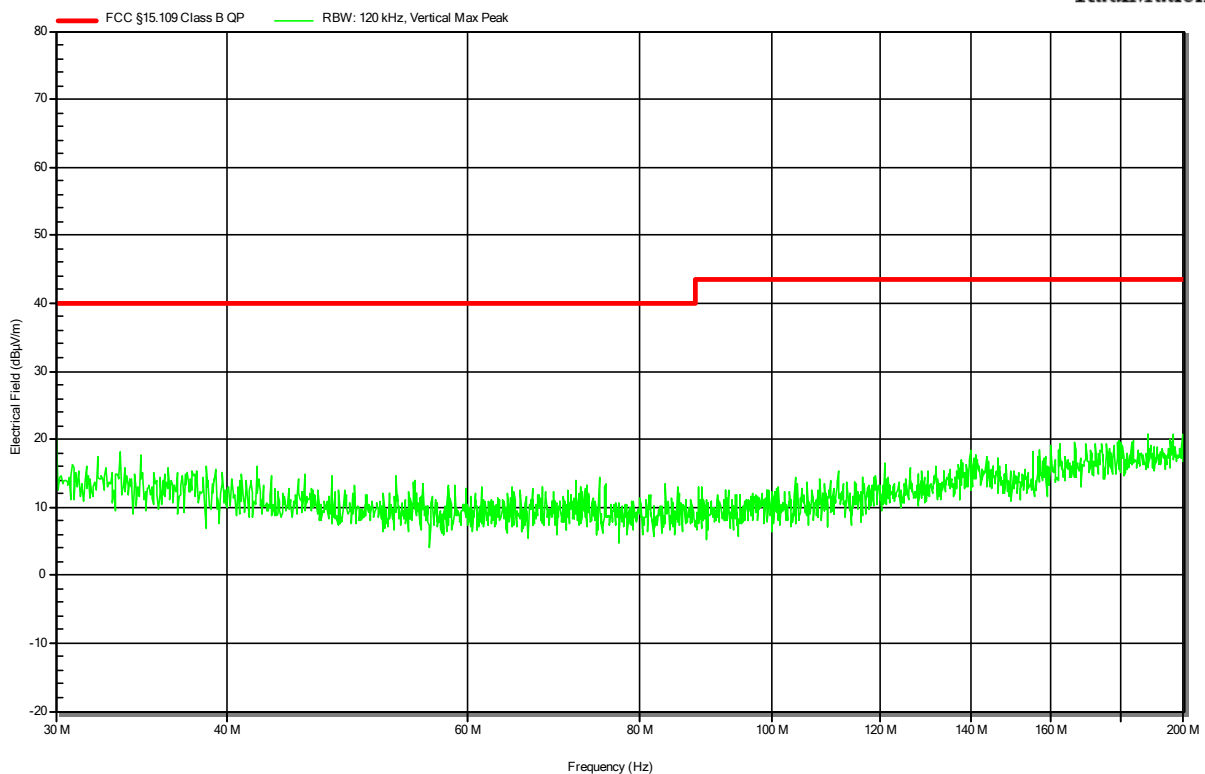
2.1.8 Records

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

Project Number:	G0M-2104-9736
Applicant:	ANDREAS STIHL AG & Co. KG
Model Description:	STIHL Smart Connector 2 A / STIHL Part No. CA01-400-4900-A
Model:	SC2A
Test Sample ID:	34803
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Date:	2021-06-02
Operating Conditions:	ambient temperature: 20 °Celsius power input: 36 V DC by internal power supply provided by STIHL Power Tool
Antenna:	Rohde & Schwarz HK 116, Vertical
Measurement Distance:	3m
Operational Mode & EUT Configuration:	Mode 1 Configuration 1
Note 1:	--

Index 14

RadiMation

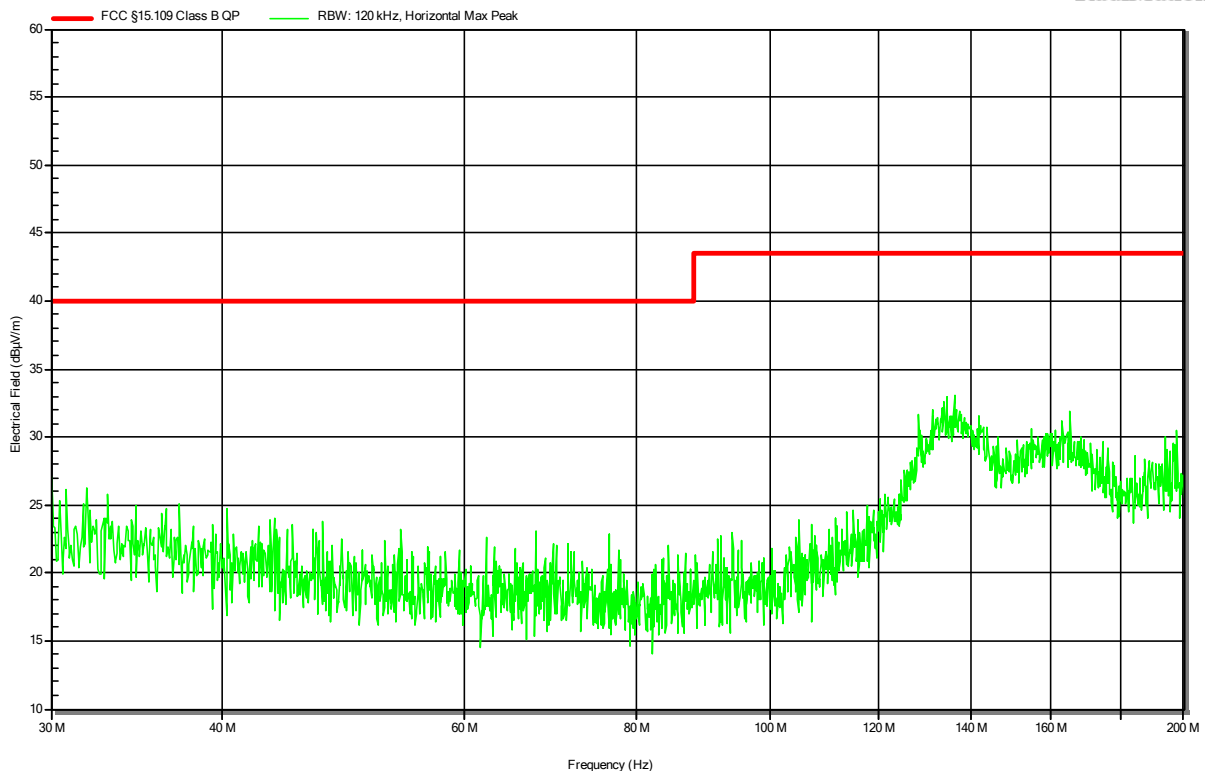


Radiated emissions according to FCC part 15B

Project Number: G0M-2104-9736
Applicant: ANDREAS STIHL AG & Co. KG
Model Description: STIHL Smart Connector 2 A / STIHL Part No. CA01-400-4900-A
Model: SC2A
Test Sample ID: 34803
Test Site: Eurofins Product Service GmbH
Operator: Mr. Liebich
Test Date: 2021-06-02
Operating Conditions: ambient temperature: 20 °Celsius
power input: 36 V DC by internal power supply provided by STIHL Power Tool
Antenna: Rohde & Schwarz HK 116, Horizontal
Measurement Distance: 3m
Operational Mode & EUT Configuration: Mode 1
Configuration 1
Note 1: --

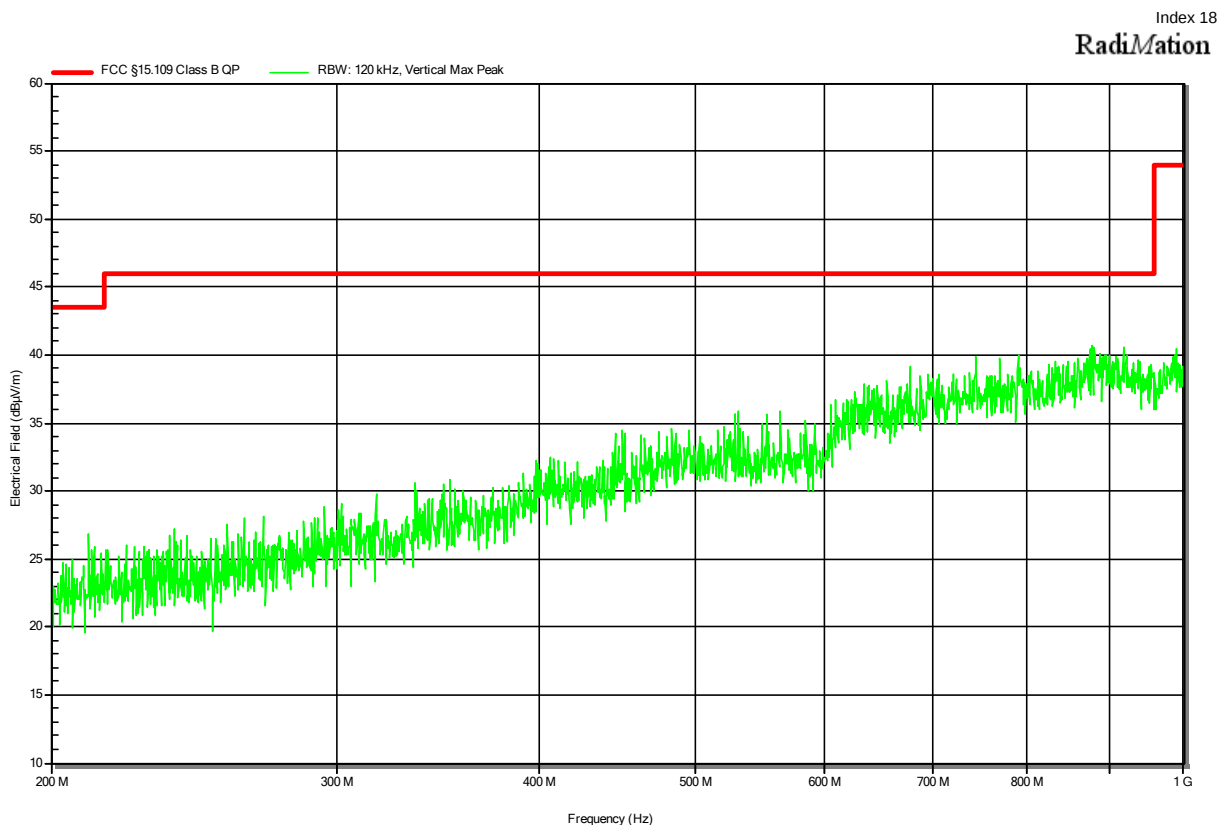
Index 15

RadiMation



Radiated emissions according to FCC part 15B

Project Number:	G0M-2104-9736
Applicant:	ANDREAS STIHL AG & Co. KG
Model Description:	STIHL Smart Connector 2 A / STIHL Part No. CA01-400-4900-A
Model:	SC2A
Test Sample ID:	34803
Test Site:	Eurofins Product Service GmbH
Operator:	Mr. Liebich
Test Date:	2021-06-02
Operating Conditions:	ambient temperature: 20 °Celsius power input: 36 V DC by internal power supply provided by STIHL Power Tool
Antenna:	Rohde & Schwarz HL 223, Vertical
Measurement Distance:	3m
Operational Mode & EUT Configuration:	Mode 1 Configuration 1
Note 1:	--

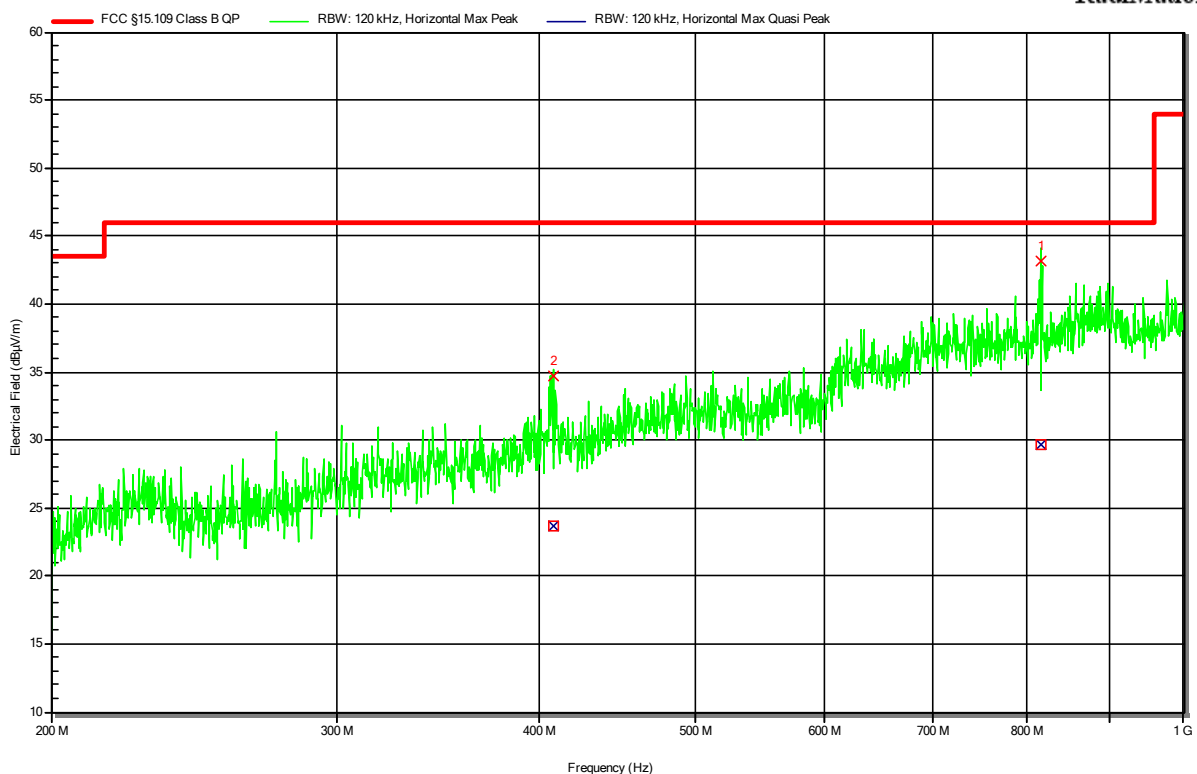


Radiated emissions according to FCC part 15B

Project Number: G0M-2104-9736
 Applicant: ANDREAS STIHL AG & Co. KG
 Model Description: STIHL Smart Connector 2 A / STIHL Part No. CA01-400-4900-A
 Model: SC2A
 Test Sample ID: 34803
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2021-06-02
 Operating Conditions: ambient temperature: 20 °Celsius
 power input: 36 V DC by internal power supply provided by STIHL Power Tool
 Antenna: Rohde & Schwarz HL 223, Horizontal
 Measurement Distance: 3m
 Operational Mode & EUT Configuration: Mode 1
 Configuration 1
 Note 1: --

Index 19

RadiMation



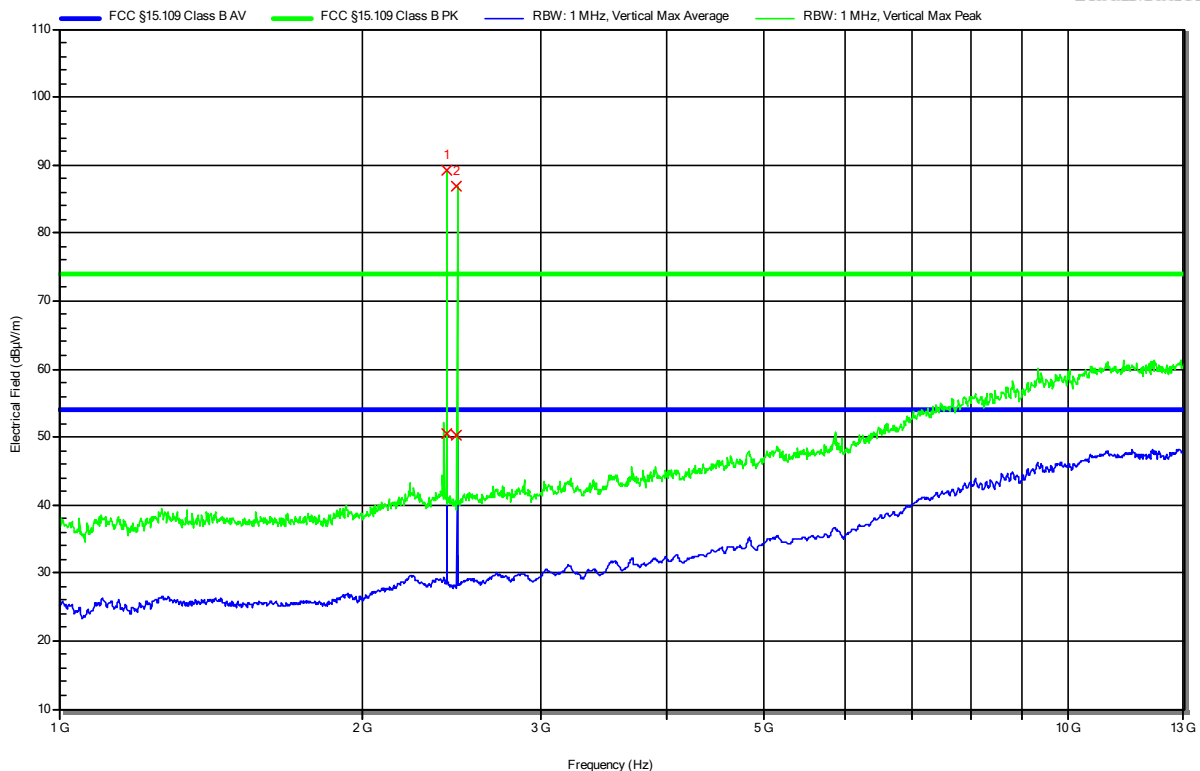
Peak Number	Frequency	Quasi-Peak	Quasi-Peak Limit	Quasi-Peak Difference	Quasi-Peak Status	Angle	Height
1	816.776 MHz	29.65 dBµV/m	46.02 dBµV/m	-16.37 dB	Pass	170 degrees	1 m
2	408.316 MHz	23.64 dBµV/m	46.02 dBµV/m	-22.38 dB	Pass	170 degrees	1 m

Radiated emissions according to FCC part 15B

Project Number: G0M-2104-9736
 Applicant: ANDREAS STIHL AG & Co. KG
 Model Description: STIHL Smart Connector 2 A / STIHL Part No. CA01-400-4900-A
 Model: SC2A
 Test Sample ID: 34803
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2021-06-02
 Operating Conditions: ambient temperature: 20 °Celsius
 power input: 36 V DC by internal power supply provided by STIHL Power Tool
 Antenna: Schwarzbeck BBHA 9120D, Vertical
 Measurement Distance: 3m
 Operational Mode & EUT Configuration: Mode 1
 Configuration 1
 Note 1: --

Index 21

RadiMation



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.426 GHz	Bluetooth-Carrier					
2	2.48 GHz						

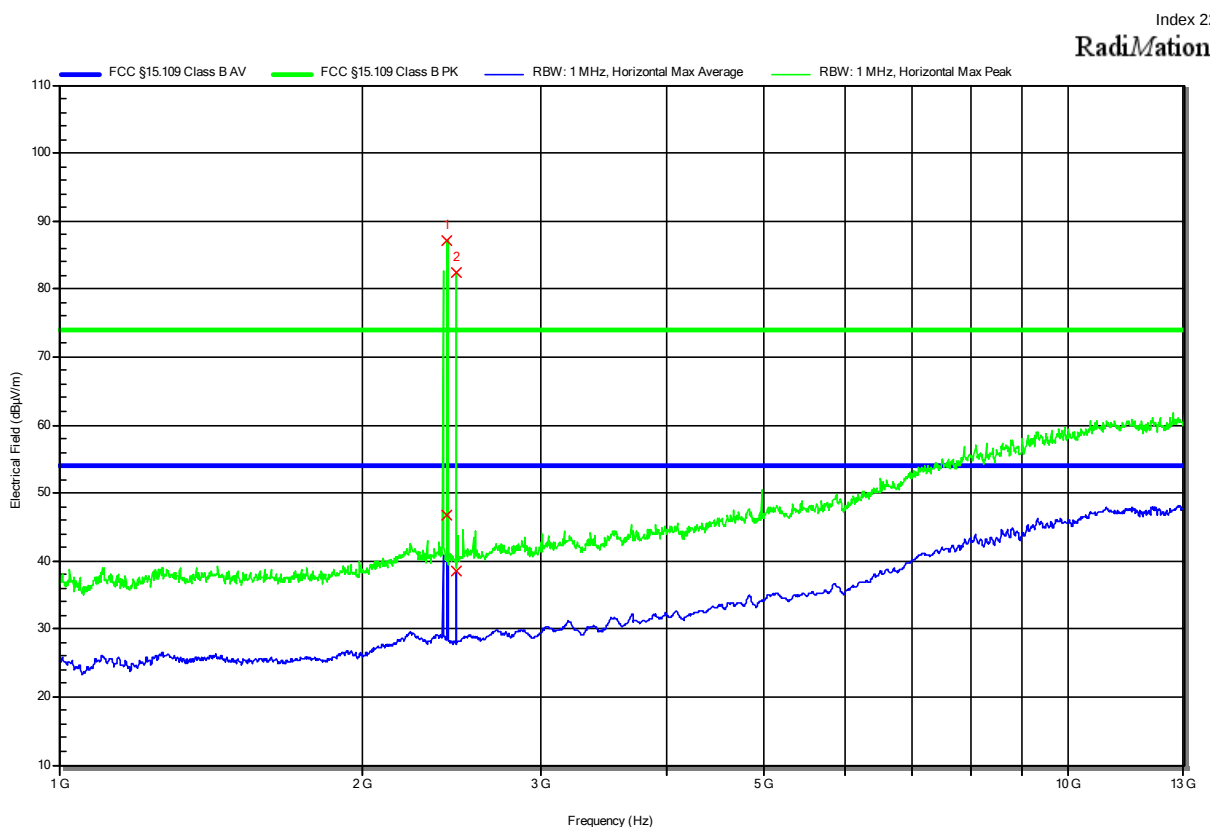
Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.426 GHz	Bluetooth-Carrier					
2	2.48 GHz						

Test Report No.: G0M-2104-9736-EF0115B-V01

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

Radiated emissions according to FCC part 15B

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 Applicant: ANDREAS STIHL AG & Co. KG
 Model Description: STIHL Smart Connector 2 A / STIHL Part No. CA01-400-4900-A
 Model: SC2A
 Test Sample ID: 34803
 Test Site: Eurofins Product Service GmbH
 Operator: Mr. Liebich
 Test Date: 2021-06-02
 Operating Conditions: ambient temperature: 20 °Celsius
 power input: 36 V DC by internal power supply provided by STIHL Power Tool
 Antenna: Schwarzbeck BBHA 9120D, Horizontal
 Measurement Distance: 3m
 Operational Mode & EUT Configuration: Mode 1
 Configuration 1
 Note 1: --



Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Angle	Height
1	2.426 GHz	Bluetooth-Carrier					
2	2.479 GHz						

Peak Number	Frequency	Average	Average Limit	Average Difference	Average Status	Angle	Height
1	2.426 GHz	Bluetooth-Carrier					
2	2.479 GHz						