

Test Report

21-1-0132201T13a



Number of pages: 14 **Date of Report:** 2022-Feb-22

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Fax: + 49 (0) 20 54 / 95 19-150 **Applicant:** SOMMER Antriebs- und
Funktechnik GmbH

**Test Object /
Tested Device(s):** Receiver Module
Home Link module 310 MHz

FCC ID: T8C105 **IC:** 6496A-105

**Testing has been
carried out in
accordance with:** **FCC Regulations:**
Title 47 CFR, Chapter I
FCC Regulations, Subchapter A
Subpart B: §15.109 (Class B limits)

ISED Regulations:
ICES-003, Issue 6 (Class B limits)

Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".

Test Results: **The EUT complies with the requirements in respect of selected parameters subject to the test.**
The test results relate only to devices specified in this document

Signatures:

Dipl.-Ing. Ninovic Perez
Test Lab Manager
Authorization of test report

B.Sc H.Laayouni
Test manager
Responsible of test report

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The listed attachments are separate documents.

1 General information

1.1 Disclaimer and Notes

The test results of this test report relate exclusively to the test item specified in this test report as specified in chapter 2.7. CETECOM does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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Also we refer on special conditions which the applicant should fulfill according §2.927 to §2.948, special focus regarding modification of the equipment and availability of sample equipment for market surveillance tests.

1.1. Summary of Test Results

Test case	Reference in FCC <input checked="" type="checkbox"/>	Reference in ISED <input checked="" type="checkbox"/>	Reference in RSS-GEN <input checked="" type="checkbox"/>	Remark	Result
<u>AC-Power Lines Conducted Emissions</u>	§15.107	ICES-003, Issue 6	RSS-Gen., Issue 5 Chapter 8.9, Chapter 7.3	--	PASSED
<u>Radiated field strength emissions 30 MHz – 1 GHz</u>	§15.109 §15.33 §15.35	ICES-003, Issue 6	RSS-Gen., Issue 5 Chapter 8.9, Chapter 7.3	--	PASSED

PASSED

The EUT complies with the essential requirements in the standard.

FAILED

The EUT does not comply with the essential requirements in the standard.

NP

The test was not performed by the CETECOM Laboratory.

*The calculation of the measurement uncertainty shows compliance with the "maximum measurement uncertainties" of the tested standard and therefore for result evaluation the stated uncertainties will not be additionally added to the measured results.

1.2. Summary of Test Methods

Test case	Test method
AC-Power Lines Conducted Emissions	ANSI C63.4-2014 chapter 7
Radiated field strength emissions 30 MHz – 1 GHz	ANSI C63.4-2014 chapter 8.2.3

2 Administrative Data

2.1 Identification of the Testing Laboratory

Company name:	CETECOM GmbH
Address:	Im Teelbruch 116 45219 Essen - Kettwig Germany
Responsible for testing laboratory:	Dipl.-Ing. Ninovic Perez
Accreditation scope:	DAkkS Webpage
Test location:	CETECOM GmbH; Im Teelbruch 116; 45219 Essen - Kettwig

2.2 General limits for environmental conditions

Temperature:	22±2 °C
Relative. humidity:	45±15% rH

2.3 Test Laboratories sub-contracted

Company name:	--
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2.4 Organizational Items

Order No.:	1
Responsible test manager:	B.Sc H.Laayouni
Receipt of EUT:	2021-Jan-17
Date(s) of test:	2021-Jan-26
Version of template:	14.3

2.5 Applicant's details

Applicant's name:	SOMMER Antriebs- und Funktechnik GmbH
Address:	Hans-Boeckler Straße 27 73230 Kirchheim unter Teck Germany
Contact Person:	Mr. Jochen Lude
Contact Person's Email:	j.lude@sommer.eu

2.6 Manufacturer's details

Applicant's name:	SOMMER Antriebs- und Funktechnik GmbH
Address:	Hans-Boeckler Straße 27 73230 Kirchheim unter Teck
	Germany

2.7 EUT: Type, S/N etc. and short descriptions used in this test report

Short description*)	PMT Sample No.	Product	Model	Type	S/N	HW status	FW status
EUT 01	21-1-01322S08_C01	Receiver Module	Home Link module 310 MHz	n/a	--	RM20-310-x	S10838-00006

*) EUT short description is used to simplify the identification of the EUT in this test report.

2.8 Auxiliary Equipment (AE): Type, S/N etc. and short descriptions

Short description*)	PMT Sample No.	Auxiliary Equipment	Model	Type	S/N	HW status	SW status
AE 1	20-1-01322S13_C01	garage door opener	2110 pro+	n/a	S10065-00251	LW-A-1-TRM01-868	S10065-00251
AE 2	20-1-01322S24_C01	Wall control Unit	--	n/a	n/a	n/a	n/a

*) AE short description is used to simplify the identification of the auxiliary equipment in this test report.

2.9 Connected cables

Short description*)	PMT Sample No.	Cable type	Connectors	Lenght
CAB 1	--	--	--	--

*) CAB short description is used to simplify the identification of the connected cables in this test report.

2.10 Softwares

Short description*)	PMT Sample No.	Software	Type	S/N	HW status	SW status
--	--	--	--	--	--	--

*) SW short description is used to simplify the identification of the used softwares in this test report.

2.11 EUT set-ups

set-up no.*)	Combination of EUT and AE	Description
1	EUT 01 + AE01 + AE02	For conducted emission Measurement
2	EUT 01	For radiated emission Measurement

*) EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

2.12 EUT operation modes

EUT operating mode no.*)	Operating modes	Additional information
Operating mode 1	Receive mode	Receive mode was set on the EUT during the Measurement

*) EUT operating mode no. is used to simplify the test report.

3 Equipment under test (EUT)

3.1 General Data of Main EUT as Declared by Applicant

Product name	Home Link module 310 MHz		
Kind of product	Receiver Module		
Firmware	<input checked="" type="checkbox"/> for normal use	<input type="checkbox"/> Special version for test execution	
Power supply	<input type="checkbox"/> AC Mains	-	
	<input checked="" type="checkbox"/> DC Mains	3VDC (over AE1)	
	<input type="checkbox"/> Battery	-	
Operational conditions	T _{nom} =-- °C	T _{min} =-40 °C	T _{max} =80 °C
EUT sample type	Pre-Production		
Weight	0,1Kg		
Size	9.0 x 4.0 x 1.0 cm		
Interfaces/Ports	--		
For further details refer Applicants Declaration & following technical documents			

3.2 Modifications on Test sample

Additions/deviations or exclusions	--
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4 Measurements

4.1 AC-Power Lines Conducted Emissions

4.1.1 Description of the general test setup and methodology, see below example:

The radio frequency voltage conducted back into the AC power line in the frequency range 150 kHz to 30 MHz has to be investigated.

Compliance should be tested by measuring the radio frequency voltage between each power line and ground at the power terminals in the stated frequency range.

A 50 Ohm / 50 μ H line impedance stabilization network (LISN) is used coupling the interface to the measurement equipment.

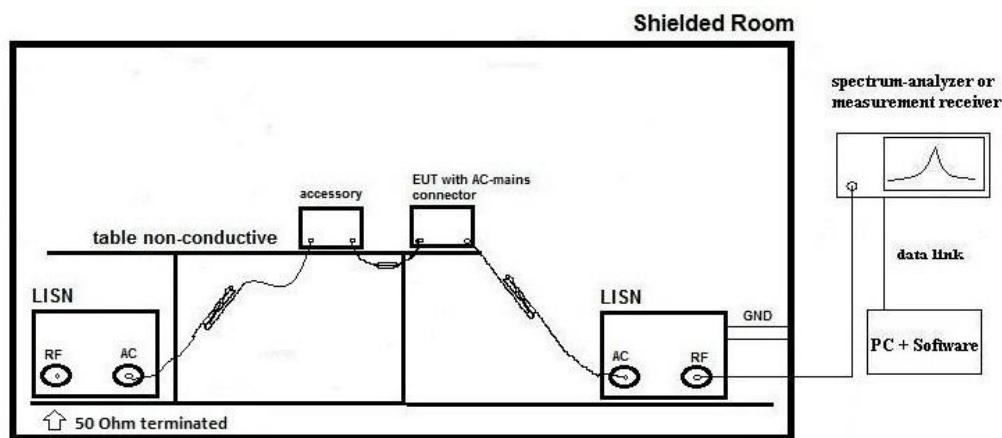
The EUT power input leads are connected through the LISN to the AC-power source. The LISN enclosure is electrically connected to the ground plane. The measuring instrument is connected to the coaxial output of the LISN.

Tabletop devices were set-up on an 80 cm height above reference ground plane, floor standing equipment 10 cm raised above ground plane.

Measurements have been performed on each phase line and neutral line of the devices AC-power lines.

The EUT was power supplied with 120 V/60 Hz. The EUT was tested in the defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

Schematic:



Testing method:

The measurement is made according to relevant reference clauses:

(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

Exploratory, preliminary measurements

As a first step, determines the worst-case phase line (neutral or phase) as well as the most critical operating mode of the equipment. A complete frequency-sweep with PK-Detector is performed on each current-carrying conductor.

Final measurement on critical frequencies

For power phases and critical frequencies (Margin to AV- or QP limit lower than 3 dB) as a second step includes measurements with receivers detector set to Quasi-Peak and Average.

Formula:

$$V_C = V_R + C_L \quad (1)$$

$$M = L_T - V_C \quad (2)$$

V_C = measured Voltage –corrected value

V_R = Receiver reading

C_L = Cable loss

M = Margin

L_T = Limit

All units are dB-units, positive margin means value is below limit.

4.1.2 Measurement Location

Test site	120919 – Conducted Emission
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4.1.3 Limit

Frequency Range [MHz]	QUASI-Peak [dB μ V]	AVERAGE [dB μ V]
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

4.1.4 Result

Diagram	set-up	Mode	Power Line	Max [dB μ V]	Detector	Result
1.01	1	OP mode 1	L1	50.89	QP	Passed

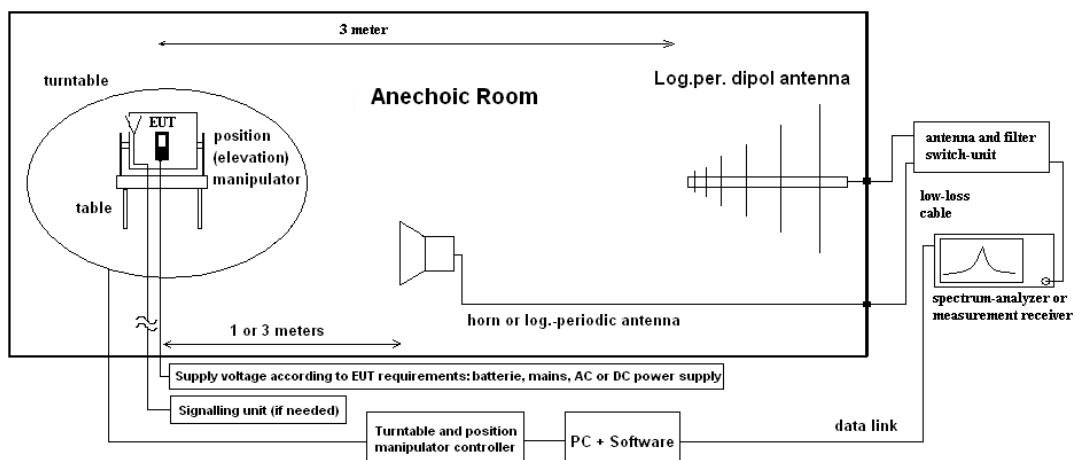
Remark: see more in diagrams in separate document **CETECOM_TR21_1_0132201T13a_A1**

4.2 Radiated field strength emissions 30 MHz – 1 GHz

4.2.1 Description of the general test setup and methodology, see below example:

Evaluating the field emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a NSA-compliant semi anechoic room (SAR) recognized by the regulatory commissions.

Schematic:



Testing method:

The measurement is made according to relevant reference clauses:

(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 0.8 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 90°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and its characteristics was recorded with an EMI-receiver, broadband antenna and software.

Measurement antenna: horizontal and vertical, heights: 1,0 m and 1,82 m as worst-case determined by an exploratory emission measurements. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by main-taining the EUT's worst-case operation mode, cable position, etc. either on 10m OATS or 3m semi-anechoic room.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position). The measurement antenna height between 1 m and 4 m.

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out

Formula:

$$E_C = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_C \quad (2)$$

AF = Antenna factor

C_L = Cable loss

D_F = Distance correction factor (if used)

E_C = Electrical field – corrected value

E_R = Receiver reading

G_A = Gain of pre-amplifier (if used)

L_T = Limit

M = Margin

All units are dB-units, positive margin means value is below limit.

4.2.2 Measurement Location

Test site	120901 - SAC - Radiated Emission <1GHz
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4.2.3 Limit

Frequency Range [MHz]	Class B <input checked="" type="checkbox"/> (3 meters)		Class A <input type="checkbox"/> (10 meters)		Detector	RBW / VBW [kHz]
	Limit [μV/m]	Limit [dBμV/m]	Limit [μV/m]	Limit [dBμV/m]		
30 - 88	100	40.0	90	39.0	Quasi peak	100 / 300
88 - 216	150	43.5	150	43.5	Quasi peak	100 / 300
216 - 960	200	46.0	210	46.4	Quasi peak	100 / 300
960 - 1000	500	54.0	300	49.5	Quasi peak	100 / 300

4.2.4 Result

Diagram	set-up	Mode	Maximum Level [dBμV/m] Frequency Range 30 – 1000 MHz	Result
3.01	2	Op mode 1	32.89 dBμV/m @ 799.77MHz	Passed

Remark: for more informations and graphical plot see annex A1 [CETECOM_TR21_1_0132201T13a_A1](#)

4.3 Results from external laboratory

None

-

4.4 Opinions and interpretations

None

-

4.5 List of abbreviations

None

-

5 Equipment lists

ID	Description	Manufacturer	SerNo	Cal due date
	120919 – Conducted emission			
20005	AC - LISN 50 Ohm/50µH ESH2-Z5	Rohde & Schwarz Messgerätebau GmbH	861741/005	2022-May-05
20007	Single-Line V-Network (50 Ohm/5µH) ESH3-Z6	Rohde & Schwarz Messgerätebau GmbH	892563/002	2022-May-05
20468	Digital Multimeter Fluke 112	Fluke Deutschland GmbH	90090455	2024-Jun-01
20556	Thermo-/Hygrometer WS-9400	Conrad Electronic GmbH	--	2023-Jul-15
20033	RF-current probe (100kHz-30MHz) ESH2-Z1	Rohde & Schwarz Messgerätebau GmbH	879581/18	2023-Jun-01
20377	EMI Test Receiver ESCS30	Rohde & Schwarz Messgerätebau GmbH	100160	2022-May-18
	120901 - SAC - Radiated Emission <1GHz			
20574	Biconilog Hybrid Antenna BTA-L	Frankonia GmbH	980026L	03.05.2022
20620	EMI Test Receiver ESU26	Rohde & Schwarz Messgerätebau GmbH	100362	21.06.2022
20482	filter matrix Filter matrix SAR 1	CETECOM GmbH	-	
20885	Power Supply EA3632A	Agilent Technologies Deutschland GmbH	75305850	
20487	System CTC NSA-Verification SAR-EMI System EMI field (SAR) NSA	ETS-Lindgren GmbH	-	23.03.2022

6 Measurement Uncertainty valid for conducted/radiated measurements

The reported uncertainties are calculated based on the standard uncertainty multiplied with the appropriate coverage factor k , such that a confidence level of approximately 95% is achieved. For uncertainty determination, each component used in the concrete measurement set-up was taken in account and its contribution to the overall uncertainty according its statistical distribution calculated.

RF-Measurement	Reference	Frequency range	Calculated uncertainty based on a confidence level of 95%							Remarks
Conducted emissions (U CISPR)	-	9 kHz - 150 kHz 150 kHz - 30 MHz	4.0 dB 3.6 dB							-
Power Output radiated	-	30 MHz - 4 GHz	3.17 dB							Substitution method
Power Output conducted	-	Set-up No.	Cel-C1	Cel-C2	BT1	W1	W2	--	--	-
		9 kHz - 12.75 GHz	N/A	0.60	0.7	0.25	N/A	--	--	
		12.75 - 26.5 GHz	N/A	0.82	--	N/A	N/A	--	--	
Conducted emissions on RF-port	-	9 kHz - 2.8 GHz	0.70	N/A	0.70	N/A	0.69	--	--	N/A - not applicable
		2.8 GHz - 12.75 GHz	1.48	N/A	1.51	N/A	1.43	--	--	
		12.75 GHz - 18 GHz	1.81	N/A	1.83	N/A	1.77	--	--	
		18 GHz - 26.5 GHz	1.83	N/A	1.85	N/A	1.79	--	--	
Occupied bandwidth	-	9 kHz - 4 GHz	0.1272 ppm (Delta Marker)							Frequency error
			1.0 dB							Power
Emission bandwidth	-	9 kHz - 4 GHz	0.1272 ppm (Delta Marker)							Frequency error
			See above: 0.70 dB							Power
Frequency stability	-	9 kHz - 20 GHz	0.0636 ppm							-
Radiated emissions Enclosure	-	150 kHz - 30 MHz	5.01 dB							Magnetic field strength
		30 MHz - 1 GHz	5.83 dB							Electrical Field strength
		1 GHz - 18 GHz	4.91 dB							
		18 GHz - 26.5 GHz	5.06 dB							

7 Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2022-Feb-17
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End Of Test Report