EMI – TEST REPORT

- Human Exposure -

Type / Model Name	:	System master basic
Product Description	:	WLAN module
Applicant	:	BSH Hausgeräte GmbH
Address	:	Im Gewerbepark B10
		93059 REGENSBURG, GERMANY
Manufacturer	:	BSH Hausgeräte GmbH
Address	:	Im Gewerbepark B10
		93059 REGENSBURG, GERMANY

Test Result according to the standards listed in clause 1 test standards:	**POSITIVE**

Test Report No. : T44223-02-07HS	19. November 2019 Date of issue

Deutsche Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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FCC ID: 2AHES-SMB **IC: 21152-SMB**

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969

Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1091	Radiofrequency radiation exposure evaluation: **mobile devices**.
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: **portable devices**.
KDB 447498 D01 v06	Mobile and portable devices RF Exposure procedures and equipment authorisation policies, October 23, 2015.
KDB 865664 D01 v01r04	SAR Measurement Requirements for 100 MHz to 6 GHz, August 7, 2015.
ANSI C95.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
ETSI TR 100 028 V1.3.1: 2001-03,	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2

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2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – See ATTACHMENT A

2.2 Equipment type, category

WLAN - AP, WLAN – Client, fixed equipment.

2.3 Short description of the equipment under test (EUT)

The EUT is a communication module for assembling into house hold devices.

Number of tested samples: 1
Serial number: Muster 286
Firmware version WLAN: 7.45.165

EUT configuration:
(The CDF filled by the applicant can be viewed at the test laboratory.)

2.4 Variants of the EUT

There are no variants.

2.5 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.
The operating frequency is 5150 MHz to 5850 MHz.

2.6 Antenna

The following antenna shall be used with the EUT:

Number	Characteristic	Model number	Connector	Frequency range (GHz)	Gain 5GHz (dBi)	Cable loss (dB)	effective Gain 5 GHz (dBi)
1	Omni	PCB antenna (Ant0)	-	5	3.99	0	3.99
2	Omni	PCB antenna (Ant1)	-	5	3.14	0	3.14

Number	Characteristic	Model number	Connector	Frequency range (GHz)	Gain (dBi)	Cable loss (dB)	Effective gain (dBi)
1	Omni	PCB antenna (Ant0)	-	2.4	2.25	0	2.25
2	Omni	PCB antenna (Ant1)	-	2.4	1.64	0	1.64

2.7 Power supply system utilised

Power supply voltage, V_{nom} : 12 VDC

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3 TEST RESULT SUMMARY

WLAN device using digital modulation:

Operating in the 2400 MHz – 2483.5 MHz and 5725 MHz – 5850 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.247(i)	RSS 102, 2.5.2	MPE	passed
KDB 447498	RSS 102, 2.5.1	SAR exclusion consideration	not applicable
OET Bulletin 65	RSS102, 3.2	Co-location, Co-transmission	passed

The mentioned RSS Rule Parts in the above table are related to:
RSS 102, Issue 5, March 2015

3.1 Final assessment

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 11 October 2019

Testing concluded on : 14 October 2019

Checked by:

Klaus Gegenfurtner
I confirm the correctness and integrity of this document.
2019.11.19 14:34:48 +01'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

I am the author of this document
2019.11.19 14:06:53 +01'00'

Hermann Smetana
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 °C
Humidity:	30-60 %
Atmospheric pressure:	86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 % The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement Type	Range	Confidence Level	Calculated Uncertainty
AC power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
EBW and OBW	2400 MHz to 3000 MHz	95%	$\pm 2.5 \times 10^{-7}$
Maximum peak conducted output power	2400 MHz to 3000 MHz	95%	± 0.62 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB
Conducted Spurious Emissions	10000 MHz to 40000 MHz	95%	± 3.47 dB
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Field strength of the fundamental	100 kHz to 100 MHz	95%	± 3.53 dB

5 HUMAN EXPOSURE

5.1 Maximum permissible exposure (MPE)

For test instruments and accessories used see section 6 Part **CPC 3**.

5.1.1 Description of the test location

Test location: NONE

5.1.2 Applicable standard

According to FCC Part 15, Section 15.247(i):
Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.
The test methods used comply with ANSI/IEEE C95.1, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".
This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

5.1.3 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.3 of this document. Through the Friis transmission formula, the known maximum gain of the antenna and the maximum power, can be calculated the MPE in a defined distance away from the product.

Friis transmission formula: $$P_d = \frac{P_{out} * G}{4 * \Pi * r^2}$$

Where:
P_d =power density (mW/cm^2)
P_{out} = output power to antenna (mW)
G = gain of antenna (linear scale)
r = distance between antenna and observation point (cm)

According to FCC Rules 47CFR 2.1093(b) the EUT is not a portable device. The EUT is designed to be used that radiating structures are 20 cm outside of the body of the user. (r = 20 cm)

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5.1.4 Test result

The following rated output power are taken from the operational description:

BT	3.5 dBm	
BLE	3.5 dBm	
WLAN 2.4 G	18.0 dBm	
WLAN 5G	18.0 dBm	

BT

Rated output power:	3.5 dBm	2.3 mW
Tune-up tolerance:	2.00 dB	
Maximum output power:	5.5 dBm	3.6 mW
Antenna gain max:	2.25 dBi	
Maximum EIRP:	7.8 dBm	6.0 mW
Minimum distance r:	20.0 cm	

BLE

Rated output power:	3.5 dBm	2.3 mW
Tune-up tolerance:	2.00 dB	
Maximum output power:	5.5 dBm	3.6 mW
Antenna gain max:	2.25 dBi	
Maximum EIRP:	7.8 dBm	6.0 mW
Minimum distance r:	20.0 cm	

WLAN 2.4 G

Rated output power:	18.0 dBm	63.0 mW
Tune-up tolerance:	2.00 dB	
Maximum output power:	20.0 dBm	99.8 mW
Antenna gain max:	2.25 dBi	
Maximum EIRP:	22.2 dBm	167.6 mW
Minimum distance r:	20.0 cm	

WLAN 5 G

Rated output power:	18.0 dBm	63.0 mW
Tune-up tolerance:	2.00 dB	
Maximum output power:	20.0 dBm	99.8 mW
Antenna gain max:	3.99 dBi	
Maximum EIRP:	24.0 dBm	250.2 mW
Minimum distance r:	20.0 cm	

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For FCC:

Transmit operating mode	Frequency range	max. EIRP	Antgain	EIRP	G	EIRP	S	Limit S_{eq}	Margin	Exposure ratio
	(MHz)	(dBm)	(dBi)	(mW)	linear	(W)	(mW/cm^2)	(mW/cm^2)	(mW/cm^2)	(%)
BT	2400 - 2483.5	7.8	2.25	5.99	1.68	0.0060	0.0012	1.0	-0.9988	0.12
BLE	2400 - 2483.5	7.8	2.25	5.99	1.68	0.0060	0.0012	1.0	-0.9988	0.12
802.11b/g/n	2401 - 2483.5	22.2	2.25	167.63	1.68	0.1676	0.0333	1.0	-0.9667	3.33
802.11a/n/ac	5150 - 5850	24.0	3.99	250.23	2.51	0.2502	0.0498	1.0	-0.9502	4.98

Limits for maximum permissible exposure (MPE):

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(B) Limits for General Population / Uncontrolled Exposure				
0.3 – 1.34	614	1.63	100	30
1.34 – 30	824/*f*	2.19/*f*	180/ f^2	30
30 - 300	27.5	0.073	0.2	30
300-1500	---	---	*f*/1500	30
1500-100000	**---**	**---**	**1.0**	**30**

f = Frequency in MHz

For ISED:

Transmit operating mode	Frequency range	max. EIRP	Antgain	Limit	Margin	Exposure
	(MHz)	(mW)	(dBi)	(W)	(W)	(%)
BT	2400 - 2483.5	6.0	2.25	2.6764	-2.670	0.22
BLE	2400 - 2483.5	6.0	2.25	2.6787	-2.673	0.22
802.11b/g/n	2401 - 2483.5	167.6	2.25	2.6840	-2.516	6.25
802.11a/n/ac	5150 - 5850	250.2	3.99	4.5253	-4.275	5.53

Exemption limits for routine Evaluation – RF exposure evaluation according RSS102, 2.5.2:

At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 $f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

Determination of the limit:

Transmit operating mode	Frequency range	Lowest CH	Factor	$f^{0.6834}$	Limit
	(MHz)	(MHz)			(W)
BT	2400 - 2483.5	2402	0.0131	204.3072	2.6764
BLE	2400 - 2483.5	2405	0.0131	204.4815	2.6787
802.11b/g/n	2401 - 2483.5	2412	0.0131	204.8881	2.6840
802.11a/n/ac	5150 - 5850	5180	0.0131	345.4403	4.5253

The requirements are **FULFILLED.**

Remarks: _____

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5.2 Co-location and Co-transmission

Applicable standard:
OET Bulletin 65, Edition 97-01, Section 2: Multiple-transmitter sites and Complex Environments

The FCC's MPE limits vary with frequency. Therefore, in mixed or broadband RF fields where several sources and frequencies are involved, the fraction of the recommended limit (in terms of power density or square of the electric or magnetic field strength) incurred within each frequency interval should be determined, and the sum of all fractional contributions should not exceed 1.0, or 100 % in terms of percentage.

1. BT:	P_d = 0.0060 mW/cm^2 Limit: 1.0 mW/cm^2 Fraction of MPE: 0.12 %
2. BLE:	P_d = 0.0060 mW/cm^2 Limit: 1.0 mW/cm^2 Fraction of MPE: 0.12 %
2. WLAN 2.4 G:	P_d = 0.0333 mW/cm^2 Limit: 1.0 mW/cm^2 Fraction of MPE: 3.33 %
2. WLAN 5 G:	P_d = 0.0498 mW/cm^2 Limit: 1.0 mW/cm^2 Fraction of MPE: 4.98 %

At worst case, all of the wireless technologies are on at the same time, the MPE is the sum of all fractions of every single wireless technology. This means the MPE is 8.55 % of the limit.

Co-location calculation for ISED:

1. BT:	P_d = 6.0 mW Limit: 2.6764 W Fraction of MPE: 0.22 %
2. BLE:	P_d = 6.0 mW Limit: 2.6787 W Fraction of MPE: 0.22 %
2. WLAN 2.4 G:	P_d = 167.6 mW Limit: 2.684 W Fraction of MPE: 6.25 %
2. WLAN 5 G:	P_d = 250.2 mW Limit: 4.525 W Fraction of MPE: 5.53 %

At worst case, all of the wireless technologies are on at the same time, the MPE is the sum of all fractions of every single wireless technology. This means the MPE is 12.22 % of the limit.

The requirements are **FULFILLED.**

Remarks: _____

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6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
-	-	-	-	-	-	-

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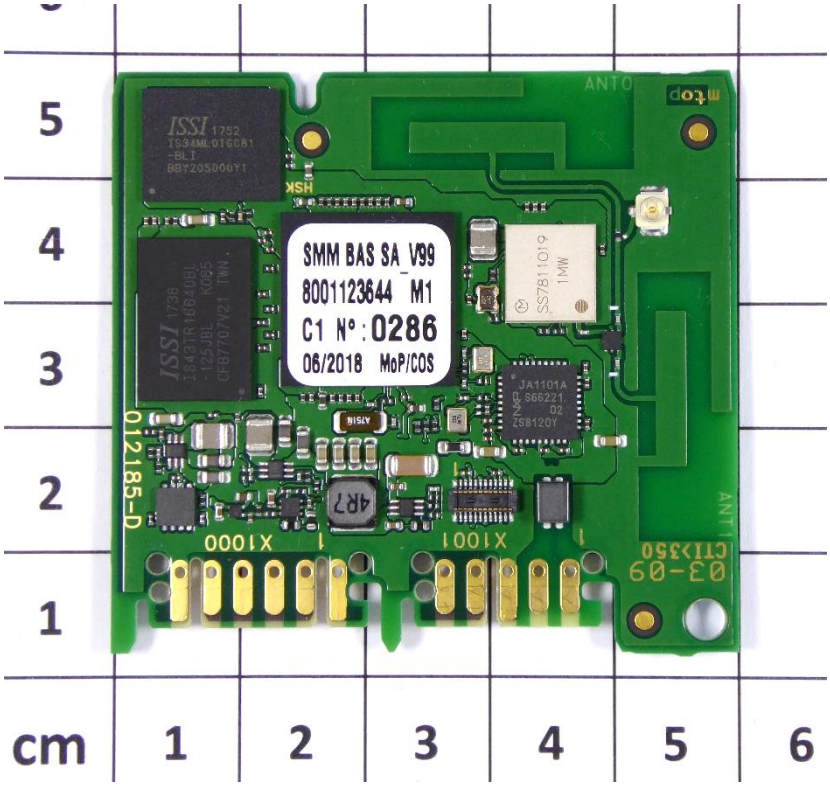
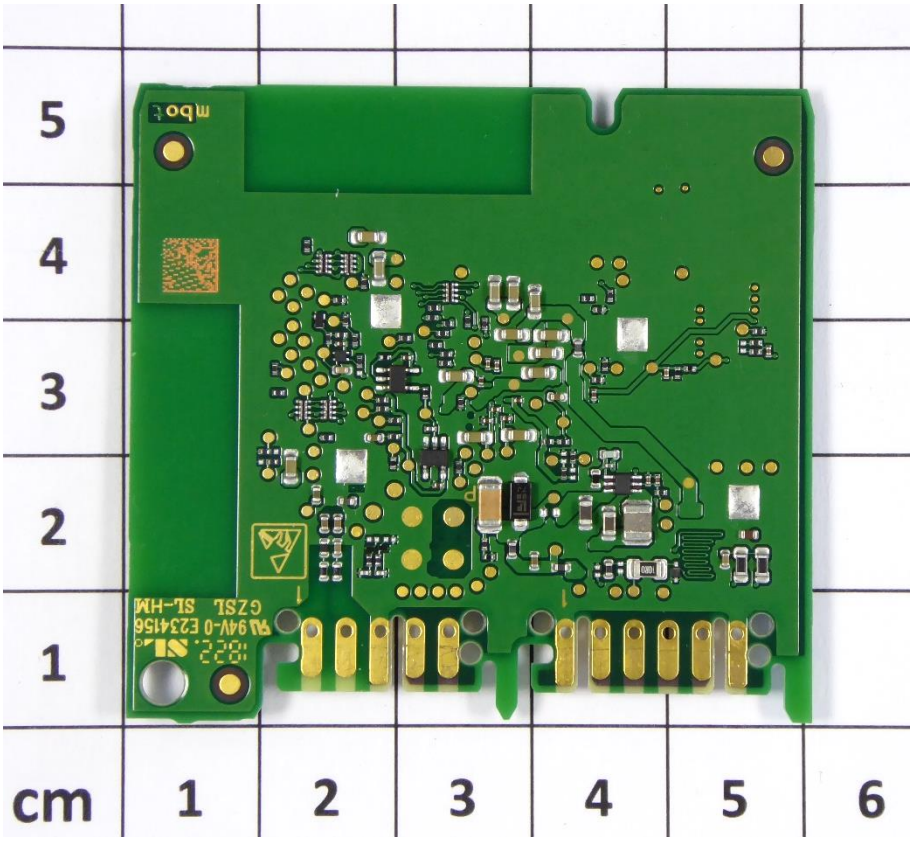
ATTACHMENT A

A1) Photo documentation of the EUT





- End of attachment A -