R F – T E S T R E P O R T

- Human Exposure -

Type / Model Name	:	SME
Product Description	:	Radio Module 802.11a/b/n/ac & BLE
Applicant	:	BSH Hausgeräte GmbH
Address	:	Carl-Wery-Straße 34
		81739 München
Manufacturer	:	BSH Hausgeräte GmbH
Address	:	Carl-Wery-Straße 34
		81739 München

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

Test Report No. : 80136616-04 Rev_0	19. December 2022 Date of issue

Deutsche Akkreditierungsstelle
D-PL-12030-01-03
D-PL-12030-01-04

Contents

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	RF Exposure procedures and equipment authorisation policies for mobile and portable devices, October 23, 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

2 EQUIPMENT UNDER TEST

2.1 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

2.2 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according his/her instructions.

2.3 General remarks

This report covers the emissions of the Module "SMB" (FCC ID: 2AHES-SMB / IC: 21152-SMB) in combination with the host device SME.

2.4 Photo documentation of the EUT – See ATTACHMENT A

2.5 Equipment type, category

WLAN - Client, mobile equipment.

2.6 Short description of the equipment under test (EUT)

The EUT is a communication module for assembling into household devices. The firmware does not support ad-hoc modes and gives the user no possibility to choose the channel for data transmission or power setting. The EUT is compatible with IEEE 802.11b, g, a, n, ac Standard and 802.15. It supports the 2.4 GHz and 5 GHz frequency band and supports no beam forming.

Tested sample:	:	1 radiated sample
Serial number	:	800121891400004403350000000242
SW	:	BSH Embedded Linux Platform (SMM S2 core) - debug [HWTEST] 40.0.0-204-g45fedbf \n \l
WLAN Firmware version		1.28 RC0.0 wl0: Apr 15 2021 03:04:08 version 7.45.234 (4ca95bb CY WLTEST) FWID 01-67595eaa
Tested sample:	:	1 conducted sample
Serial number	:	800121891400004403350000000240
SW	:	BSH Embedded Linux Platform (SMM S2 core) - debug [HWTEST] 40.0.0-204-g45fedbf \n \l
WLAN Firmware version		1.28 RC0.0 wl0: Apr 15 2021 03:04:08 version 7.45.234 (4ca95bb CY WLTEST) FWID 01-67595eaa

2.7 Variants of the EUT

There are no variants.

2.8 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz, 5150 MHz to 5350 MHz and 5470 MHz to 5850 MHz. (BLE, WLAN 2.4 GHz and WLAN 5 GHz)

Channel Plan BLE:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
37	2402	18	2442
0	2404	19	2444
1	2406	20	2446
2	2408	21	2448
3	2410	22	2450
4	2412	23	2452
5	2414	24	2454
6	2416	25	2456
7	2418	26	2458
8	2420	27	2460
9	2422	28	2462
10	2424	29	2464
38	2426	30	2466
11	2428	31	2468
12	2430	32	2470
13	2432	33	2472
14	2434	34	2474
15	2436	35	2476
16	2438	36	2478
17	2440	39	2480

Channel Plan WLAN 2.4 GHz:

802.11b, g, n HT20:

Channel	Frequency (MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

802.11n HT40

Channel	Frequency (MHz)
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

Channel Plan WLAN 5 GHz:

a / n HT20 / ac VHT20:

Channel	Frequency (MHz)
36	5180
40	5200
44	5220
48	5240
52	5260
56	5280
60	5300
64	5320
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700
144	5720
149	5745
153	5765
157	5785
161	5805
165	5825

n HT40 / ac VHT40:

Channel	Frequency (MHz)
38	5190
46	5230
54	5270
62	5310
102	5510
110	5550
118	5590
126	5630
134	5670
142	5710
151	5755
159	5795

ac VHT80:

Channel	Frequency (MHz)
42	5210
58	5290
106	5530
122	5610
138	5690
155	5775

2.9 Transmit operating modes

BLE:
The EUT uses GFSK modulation and may provide following data rates:
- 1000 kbps (kbps = *kilobits per second)*

WLAN 2.4 GHz:
The EUT use DSSS or OFDM modulation and provide following data rates with auto-fall-back:
- 802.11b 11, 5.5, 2, 1 Mbps (Mbps = *megabits per second)*
- 802.11g 54, 48, 36, 24, 18, 12, 9, 6 Mbps
- 802.11n HT20, MCS 0 – 7

WLAN 5 GHz:
The module uses OFDM modulation and is capable to provide following data rates:
- 802.11a 54, 48, 36, 24, 18, 12, 9, 6 Mbps (Mbps = *megabits per second)*
- 802.11n HT20, MCS 0 – 7
- 802.11n HT40, MCS 0 – 7
- 802.11ac VHT20, MSC 0 - 9
- 802.11ac VHT40, MSC 0 - 9
- 802.11ac VHT80, MSC 0 – 9

2.10 Antennas

The following antennas shall be used with the EUT:

Number	Characteristic	Model number	Plug	Frequency range (GHz)	Gain (dBi)
1	Omni	PCB antenna (Ant0)	-	2.4	3.45
			-	5	5.63
2	Omni	PCB antenna (Ant1)	-	2.4	3.30
			-	5	6.11

2.11 Power supply system utilised

Power supply voltage, V_{nom} : 5 V_{DC}

3 TEST RESULT SUMMARY

WLAN device using digital modulation:

Operating in the 2400 MHz – 2483.5 MHz and 5150 MHz – 5350 MHz, 5470 MHz – 5850 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
KDB 447498, 7.1	RSS 102, 2.5.2	MPE	passed
KDB 447498, 4.3.1	RSS 102, 2.5.1	SAR exclusion consideration	not applicable
KDB 447498, 7.2	RSS102, 3.2	Co-location, Co-transmission	not applicable

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 requirements cited in clause 1 test standards.

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

Testing commenced on : 24 November 2022

Testing concluded on : 24 November 2022

Checked by:

Klaus Gegenfurtner
2022.12.19 15:50:21
+01'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

Lukas Scheuermann
2022.12.19 12:38:27
+01'00'

Lukas Scheuermann
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

4.1 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 / 2011 + A1 / 2014 „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.

4.2 Conformity Decision Rule

The conformity decision rule is based on the ILAC G8 published at the time of reporting.

5 HUMAN EXPOSURE

5.1 Maximum permissible exposure (MPE)

5.1.1 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).

5.1.2 Description of Determination

The maximum output power included the tune up tolerance is used to calculate the EIRP. 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)

where $P_{out} * G$ is the radiated measured maximum output power including the tune-up tolerance.

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 at least 20 cm outside of the body of the user. (r = 20 cm)

5.1.3 Determination of MPE according FCC

Tune-up Tolerance: ± 1.5 dB
Max Antenna Gain 2.4 GHz Range: 3.45 dBi
Max Antenna Gain 5 GHz Range: 6.11 dBi

2.4 GHz Range:

BLE						
Channel	measured cond. Power	max. EIRP incl. Tune-up Tol.	P_d	Limit	Margin	Exposure ratio
No.	(dBm)	mW	mW/cm²	mW/cm²	mW/cm²	%
37	2.3	5.30	0.0011	1.0	-0.9989	0.11
39	1.5	4.39	0.0009	1.0	-0.9991	0.09

802.11b						
Channel	measured cond. Power	max. EIRP incl. Tune-up Tol.	P_d	Limit	Margin	Exposure ratio
No.	(dBm)	(mW)	(mW/cm²)	(mW/cm²)	(mW/cm²)	(%)
1	17.7	181.97	0.0362	1.0	-0.9638	3.62
11	17.7	183.65	0.0365	1.0	-0.9635	3.65

802.11n HT20						
Channel	measured cond. Power	max. EIRP incl. Tune-up Tol.	P_d	Limit	Margin	Exposure ratio
No.	(dBm)	(mW)	(mW/cm²)	(mW/cm²)	(mW/cm²)	(%)
1	21.6	450.82	0.0897	1.0	-0.9103	8.97
11	21.2	413.05	0.0822	1.0	-0.9178	8.22

5 GHz Range:

802.11n HT20						
Channel	measured cond. Power	max. EIRP incl. Tune-up Tol.	P_d	Limit	Margin	Exposure ratio
No.	(dBm)	(mW)	(mW/cm²)	(mW/cm²)	(mW/cm²)	(%)
36	9.5	51.05	0.0102	1.0	-0.9898	1.02
64	10.0	57.28	0.0114	1.0	-0.9886	1.14
100	9.5	51.64	0.0103	1.0	-0.9897	1.03
165	10.3	61.09	0.0122	1.0	-0.9878	1.22

802.11n HT40						
Channel	measured cond. Power	max. EIRP incl. Tune-up Tol.	P_d	Limit	Margin	Exposure ratio
No.	(dBm)	(mW)	(mW/cm²)	mW/cm²)	(mW/cm²)	(%)
38	7.7	33.81	0.0067	1.0	-0.9933	0.67
62	8.4	40.09	0.0080	1.0	-0.9920	0.80
102	8.1	37.50	0.0075	1.0	-0.9925	0.75
159	8.5	40.55	0.0081	1.0	-0.9919	0.81

802.11ac VHT80						
Channel	measured cond. Power	max. EIRP incl. Tune-up Tol.	P_d	Limit	Margin	Exposure ratio
No.	(dBm)	(mW)	(mW/cm^2)	(mW/cm^2)	(mW/cm^2)	(%)
42	7.7	34.12	0.0068	1.0	-0.9932	0.68
58	8.5	41.02	0.0082	1.0	-0.9918	0.82
106	8.4	39.45	0.0078	1.0	-0.9922	0.78
155	8.5	41.02	0.0082	1.0	-0.9918	0.82

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

5.1.4 Determination of MPE according ISED

Tune-up Tolerance: ± 1.5 dB
Max Antenna Gain 2.4 GHz Range: 3.45 dBi
Max Antenna Gain 5 GHz Range: 6.11 dBi

2.4 GHz Range:

BLE						
Frequency	measured cond. Power	max. EIRP incl. Tune-up Tol.	Factor	$f^{0.6834}$	Limit	Margin
MHz	(dBm)	mW		W	W	W
2402	2.3	5.30	0.0131	204.3072	2.676	-2.6711
2480	1.5	4.39	0.0131	208.8182	2.736	-2.7311

802.11b						
Frequency	measured cond. Power	max. EIRP incl. Tune-up Tol.	Factor	$f^{0.6834}$	Limit	Margin
MHz	(dBm)	(mW)		(W)	(W)	(W)
2412	17.7	181.97	0.0131	204.8881	2.684	-2.5021
2462	17.7	183.65	0.0131	207.7812	2.722	-2.5383

802.11n HT20						
Frequency	measured cond. Power	max. EIRP incl. Tune-up Tol.	Factor	$f^{0.6834}$	Limit	Margin
MHz	(dBm)	(mW)		(W)	(W)	(W)
2412	21.6	450.82	0.0131	204.8881	2.684	-2.2332
2462	21.2	413.05	0.0131	207.7812	2.722	-2.3089

5 GHz Range:

802.11n HT20						
Frequency	measured cond. Power	max. EIRP incl. Tune-up Tol.	Factor	$f^{0.6834}$	Limit	Margin
MHz	(dBm)	(mW)		(W)	(W)	(W)
5180	9.5	51.05	0.0131	345.4403	4.525	-4.4742
5320	10.0	57.28	0.0131	351.7937	4.608	-4.5512
5500	9.5	51.64	0.0131	359.8851	4.714	-4.6629
5825	10.3	61.09	0.0131	374.2857	4.903	-4.8420

802.11n HT40						
Frequency	measured cond. Power	max. EIRP incl. Tune-up Tol.	Factor	$f^{0.6834}$	Limit	Margin
MHz	(dBm)	(mW)		(W)	(W)	(W)
5190	7.7	33.81	0.0131	345.8959	4.531	-4.4974
5310	8.4	40.09	0.0131	351.3416	4.603	-4.5625
5510	8.1	37.50	0.0131	360.3321	4.720	-4.6829
5795	8.5	40.55	0.0131	372.9673	4.886	-4.8453

802.11ac VHT80						
Frequency	measured cond. Power	max. EIRP incl. Tune-up Tol.	Factor	$f^{0.6834}$	Limit	Margin
MHz	(dBm)	(mW)		(W)	(W)	(W)
5210	7.7	34.12	0.0131	346.8062	4.543	-4.5090
5290	8.5	41.02	0.0131	350.4367	4.591	-4.5497
5530	8.4	39.45	0.0131	361.2255	4.732	-4.6926

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 $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

At or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

The requirements are **FULFILLED.**

Remarks: None.