



# 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.

FCC ID: 2AHES-SMB

IC: 21152-SMB

# Contents

|          |                                                     |                  |
|----------|-----------------------------------------------------|------------------|
| <b>1</b> | <b><u>TEST STANDARDS</u></b>                        | <b><u>3</u></b>  |
| <b>2</b> | <b><u>EQUIPMENT UNDER TEST</u></b>                  | <b><u>4</u></b>  |
| 2.1      | Photo documentation of the EUT – See ATTACHMENT A   | 4                |
| 2.2      | Equipment type, category                            | 4                |
| 2.3      | Short description of the equipment under test (EUT) | 4                |
| 2.4      | Variants of the EUT                                 | 4                |
| 2.5      | Operation frequency and channel plan                | 4                |
| 2.6      | Antenna                                             | 4                |
| 2.7      | Power supply system utilised                        | 4                |
| <b>3</b> | <b><u>TEST RESULT SUMMARY</u></b>                   | <b><u>5</u></b>  |
| 3.1      | Final assessment                                    | 5                |
| <b>4</b> | <b><u>TEST ENVIRONMENT</u></b>                      | <b><u>6</u></b>  |
| 4.1      | Address of the test laboratory                      | 6                |
| 4.2      | Environmental conditions                            | 6                |
| 4.3      | Statement of the measurement uncertainty            | 6                |
| <b>5</b> | <b><u>HUMAN EXPOSURE</u></b>                        | <b><u>7</u></b>  |
| 5.1      | Maximum permissible exposure (MPE)                  | 7                |
| 5.2      | Co-location and Co-transmission                     | 10               |
| <b>6</b> | <b><u>USED TEST EQUIPMENT AND ACCESSORIES</u></b>   | <b><u>11</u></b> |
|          | <b><u>ATTACHMENT A</u></b>                          | <b><u>12</u></b> |

FCC ID: 2AHES-SMB

IC: 21152-SMB

## 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

FCC ID: 2AHES-SMB

IC: 21152-SMB

## 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

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

### **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:

Tested by:

\_\_\_\_\_  
Klaus Gegenfurtner  
Teamleader Radio

\_\_\_\_\_  
Hermann Smetana  
Radio Team

FCC ID: 2AHES-SMB

IC: 21152-SMB

## 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%              | $\pm 3.29$ 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%              | $\pm 0.62$ dB            |
| Power spectral density              | 2400 MHz to 3000 MHz   | 95%              | $\pm 0.62$ dB            |
| Conducted Spurious Emissions        | 9 kHz to 10000 MHz     | 95%              | $\pm 2.15$ dB            |
| Conducted Spurious Emissions        | 10000 MHz to 40000 MHz | 95%              | $\pm 3.47$ dB            |
| Radiated Spurious Emissions         | 9 kHz to 30 MHz        | 95%              | $\pm 3.53$ dB            |
| Radiated Spurious Emissions         | 30 MHz to 1000 MHz     | 95%              | $\pm 3.71$ dB            |
| Radiated Spurious Emissions         | 1000 MHz to 10000 MHz  | 95%              | $\pm 2.34$ dB            |
| Field strength of the fundamental   | 100 kHz to 100 MHz     | 95%              | $\pm 3.53$ dB            |

FCC ID: 2AHES-SMB

IC: 21152-SMB

## 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<sup>2</sup>)

$P_{out}$  = 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)

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

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

| Transmit operating mode | Frequency range<br>(MHz) | max. EIRP<br>(dBm) | Antgain<br>(dBi) | EIRP<br>(mW) | G<br>linear | EIRP<br>(W) | S<br>(mW/cm <sup>2</sup> ) | Limit S <sub>avg</sub><br>(mW/cm <sup>2</sup> ) | Margin<br>(mW/cm <sup>2</sup> ) | Exposure ratio<br>(%) |
|-------------------------|--------------------------|--------------------|------------------|--------------|-------------|-------------|----------------------------|-------------------------------------------------|---------------------------------|-----------------------|
| 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<br>(MHz)                                         | Electric field strength<br>(V/m) | Magnetic field strength<br>(A/m) | Power density<br>(mW/cm <sup>2</sup> ) | Averaging time<br>(minutes) |
|------------------------------------------------------------------|----------------------------------|----------------------------------|----------------------------------------|-----------------------------|
| <b>(B) Limits for General Population / Uncontrolled Exposure</b> |                                  |                                  |                                        |                             |
| 0.3 – 1.34                                                       | 614                              | 1.63                             | 100                                    | 30                          |
| 1.34 – 30                                                        | 824/f                            | 2.19/f                           | 180/ f <sup>2</sup>                    | 30                          |
| 30 - 300                                                         | 27.5                             | 0.073                            | 0.2                                    | 30                          |
| 300-1500                                                         | ---                              | ---                              | f/1500                                 | 30                          |
| <b>1500-100000</b>                                               | ---                              | ---                              | <b>1.0</b>                             | <b>30</b>                   |

f = Frequency in MHz

**For ISD:**

| Transmit operating mode | Frequency range<br>(MHz) | max. EIRP<br>(mW) | Antgain<br>(dBi) | Limit<br>(W) | Margin<br>(W) | Exposure<br>(%) |
|-------------------------|--------------------------|-------------------|------------------|--------------|---------------|-----------------|
| 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  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where f is in MHz;

Determination of the limit:

| Transmit operating mode | Frequency range<br>(MHz) | Lowest CH<br>(MHz) | Factor | f <sup>0.6834</sup> | Limit<br>(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:**

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

## 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:         | $P_d = 0.0060 \text{ mW/cm}^2$<br>Limit: $1.0 \text{ mW/cm}^2$<br>Fraction of MPE: 0.12 % |
| 2. BLE:        | $P_d = 0.0060 \text{ mW/cm}^2$<br>Limit: $1.0 \text{ mW/cm}^2$<br>Fraction of MPE: 0.12 % |
| 2. WLAN 2.4 G: | $P_d = 0.0333 \text{ mW/cm}^2$<br>Limit: $1.0 \text{ mW/cm}^2$<br>Fraction of MPE: 3.33 % |
| 2. WLAN 5 G:   | $P_d = 0.0498 \text{ mW/cm}^2$<br>Limit: $1.0 \text{ mW/cm}^2$<br>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 ISSED:

|                |                                                                       |
|----------------|-----------------------------------------------------------------------|
| 1. BT:         | $P_d = 6.0 \text{ mW}$<br>Limit: 2.6764 W<br>Fraction of MPE: 0.22 %  |
| 2. BLE:        | $P_d = 6.0 \text{ mW}$<br>Limit: 2.6787 W<br>Fraction of MPE: 0.22 %  |
| 2. WLAN 2.4 G: | $P_d = 167.6 \text{ mW}$<br>Limit: 2.684 W<br>Fraction of MPE: 6.25 % |
| 2. WLAN 5 G:   | $P_d = 250.2 \text{ mW}$<br>Limit: 4.525 W<br>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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FCC ID: 2AHES-SMB

IC: 21152-SMB

## 6 USED TEST EQUIPMENT AND ACCESSORIES

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

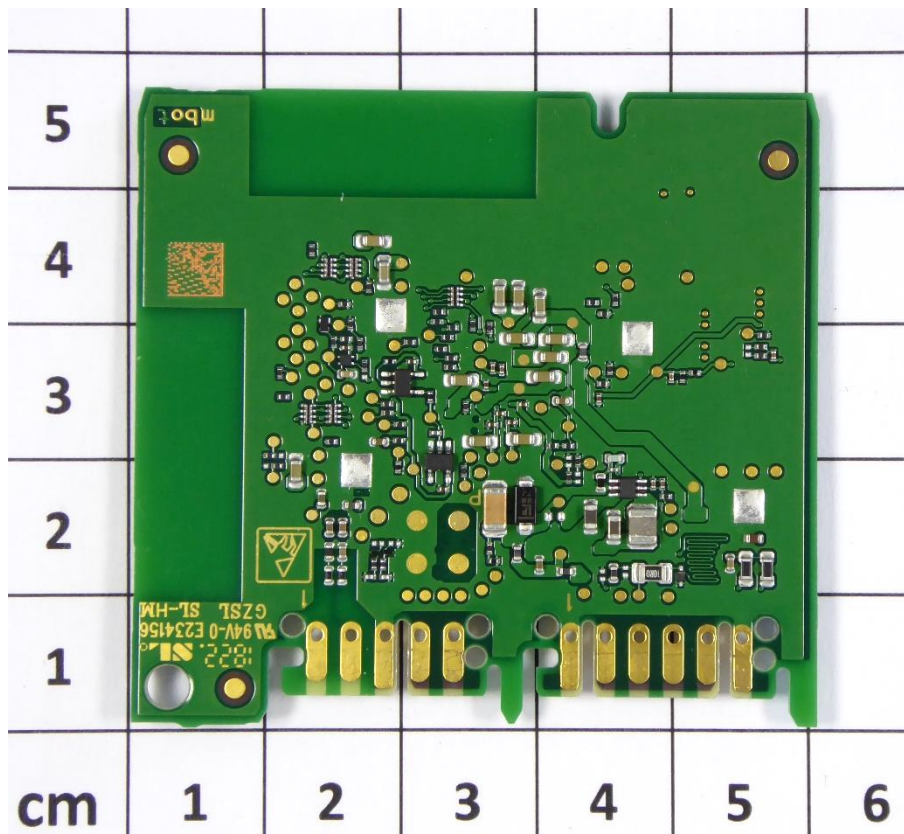
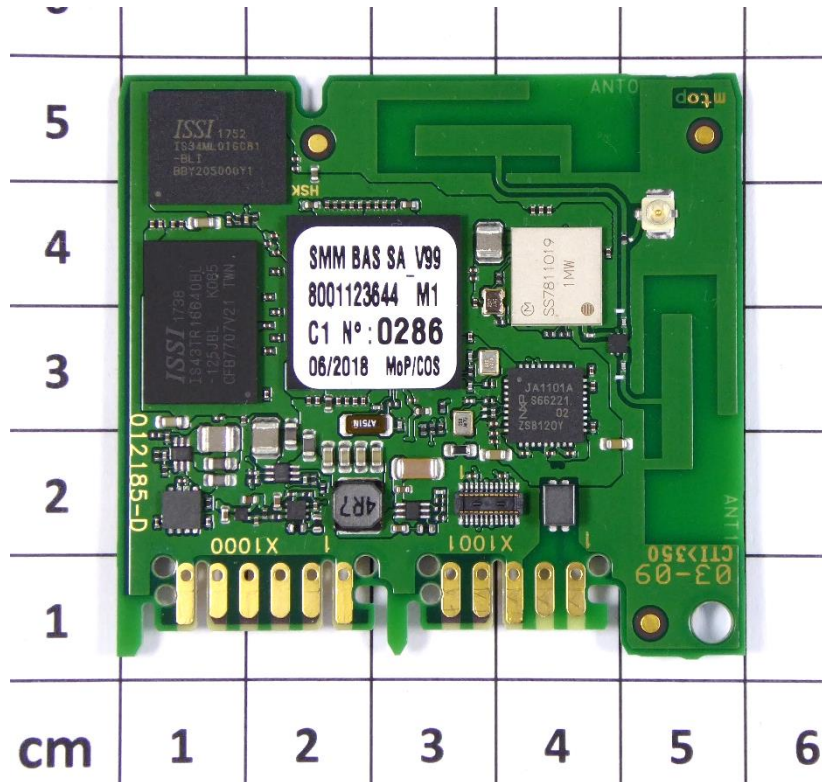
| Test ID | Model Type | Equipment No. | Next Calib. | Last Calib. | Next Verif. | Last Verif. |
|---------|------------|---------------|-------------|-------------|-------------|-------------|
| -       | -          | -             | -           | -           | -           | -           |

FCC ID: 2AHES-SMB

IC: 21152-SMB

## ATTACHMENT A

### A1) Photo documentation of the EUT



- End of attachment A -