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25.April 2018

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## Prüfbericht / Test Report

Nr. / No. TR-65350-25670-04 (Edition 2)

|                                             |                                                |
|---------------------------------------------|------------------------------------------------|
| Auftraggeber<br><i>Applicant</i>            | STORZ & BICKEL GMBH & CO.KG                    |
| Geräteart<br><i>Type of equipment</i>       | Bluetooth Low Energy (BLE) Module              |
| Typenbezeichnung<br><i>Type designation</i> | S&B Module                                     |
| Seriennummer /<br><i>Serial number</i>      | NA, Test Sample 1                              |
| FCC ID:                                     | 2APJE-SB                                       |
| IC:                                         | 23679-SB                                       |
| Auftragsnummer /<br><i>Order No.</i>        | N/A                                            |
| Prüfgrundlage<br><i>Test standards</i>      | CFR 47 Pt1.1310<br>Health Canada Safety Code 6 |

## Summary

| Prüfergebnisse / <i>Test Results</i>                                                                                                                                        |  | Auftragsnummer / <i>Order No.</i><br><b>N/A</b> |  |  |                                     |                                    |                                           |                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------|--|--|-------------------------------------|------------------------------------|-------------------------------------------|--------------------------------------------|
| Die Prüfungen wurden nach folgenden Vorschriften durchgeführt:<br><i>Tests were performed according to:</i><br><b>CFR 47 Pt1.1310</b><br><b>Health Canada Safety Code 6</b> |  |                                                 |  |  |                                     |                                    |                                           |                                            |
| Durchgeführte Prüfung<br><i>Test performed</i>                                                                                                                              |  |                                                 |  |  | Prüfergebnis<br><i>Test result</i>  |                                    |                                           |                                            |
|                                                                                                                                                                             |  |                                                 |  |  | Erfüllt<br><i>Passed</i>            | Nicht erfüllt<br><i>Not Passed</i> | Nicht zutreffend<br><i>Not applicable</i> | Nicht durchgeführt<br><i>Not performed</i> |
| Elektromagnetische Felder / <i>RF Exposure Assessment</i>                                                                                                                   |  |                                                 |  |  | <input checked="" type="checkbox"/> | <input type="checkbox"/>           | <input type="checkbox"/>                  | <input type="checkbox"/>                   |

## Bemerkungen / Remarks:

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Die Prüfergebnisse beziehen sich ausschließlich auf das zur Prüfung vorgestellte Prüfmuster. Ohne schriftliche Genehmigung des Prüflabors darf der Prüfbericht auszugsweise nicht vervielfältigt werden. *The test results relate only to the individual item which has been tested. Without the written approval of the test laboratory this report may not be reproduced in extracts.*

| Datum / Date | Geprüft von / Tested by                                                                                                           | Freigabe durch / Checked by                                                                                        | Prüfergebnis / Test Result                                                                                                |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 2018-05-18   | <br>Matthias Stumpe<br>Responsible for testing | <br>Martin Steindl<br>Reviewer | <input checked="" type="checkbox"/> Erfüllt / <i>Passed</i><br><input type="checkbox"/> Nicht erfüllt / <i>Not passed</i> |

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## 1 Administrative Data

### Application details

|                              |                                                                                  |
|------------------------------|----------------------------------------------------------------------------------|
| Applicant:                   | STORZ & BICKEL GMBH & CO.KG<br>In Grubenäcker 7-9<br>78532 Tuttlingen<br>Germany |
| Contact person:              | Berthold MAIER                                                                   |
| Order number:                | N/A                                                                              |
| Receipt of EUT:              | 2018-02-06                                                                       |
| Return of EUT:               | ---                                                                              |
| Date(s) of test:             | 2018-04-25                                                                       |
| Note(s):                     | ---                                                                              |
| Responsible for testing:     | Mr. Matthias Stumpe                                                              |
| Responsible for test report: | Mr. Matthias Stumpe                                                              |
| Test report checked by:      | Mr. Martin Steindl                                                               |

### Report details

|                |                   |
|----------------|-------------------|
| Report number: | TR-65350-25670-04 |
| Edition:       | 2                 |
| Issue date:    | 2018-05-18        |

## 2 Details about the Test Laboratory

| Details about the Test Laboratory |                                                                            |
|-----------------------------------|----------------------------------------------------------------------------|
| Company name:                     | TÜV SÜD Product Service GmbH                                               |
| Address:                          | Äußere Frühlingstraße 45<br>D-94315 Straubing<br>Germany                   |
| Contact:                          | Mr. Markus Biberger<br><br>Phone: +49 9421 5522-0<br>Fax: +49 9421 5522-99 |

### 3 Description of the Equipment Under Test

| Equipment characteristics     |                                                            |
|-------------------------------|------------------------------------------------------------|
| Type designation:             | S&B Module                                                 |
| Parts of the system:          | ---                                                        |
| Options and accessories:      | ---                                                        |
| Type of equipment:            | Bluetooth Low Energy (BLE) Module                          |
| Serial number:                | NA, Test Sample 1                                          |
| Manufacturer:                 | STORZ & BICKEL GMBH & CO.KG                                |
| Application <sup>1</sup> :    | Wideband Data Transmission Systems                         |
| Equipment class:              | Equipment for portable use - - Radio Module                |
| Kind of equipment:            | Transceiver                                                |
| Frequency band <sup>1</sup> : | 3 b (2400 – 2483.5 MHz)                                    |
| Frequency range:              | 2402 – 2480 MHz                                            |
| Operating Frequency:          | 2402 – 2480 MHz                                            |
| Channel spacing               | Wideband                                                   |
| Number of RF-channels:        | 40                                                         |
| Antenna type:                 | Integrated                                                 |
| Antenna size:                 | N/A                                                        |
| Power supply:                 | External DC supply<br>Nominal: 3.3 V                       |
| Version of EUT:               | Hardware version: BLE 0.04<br>Firmware version: FW 0.20.03 |

<sup>1</sup> Classification according to CEPT/ERC Recommendation 70-03

## 4 Operation Mode and Configuration of EUT

### Operation Mode(s)

Transmitting continuously on 2402 MHz and 2480 MHz

### List of ports and cables

| No. | Description             | Classification <sup>2</sup> | Cable type | Cable length |
|-----|-------------------------|-----------------------------|------------|--------------|
| D1  | DC Power Supply         | dc power                    | Unshielded | ≤ 3 m        |
| S1  | Configuration interface | signal/control port         | Unshielded | ≤ 3 m        |

### List of devices connected to EUT

| No. | Description     | Type designation | Serial no. or ID | Manufacturer  |
|-----|-----------------|------------------|------------------|---------------|
| 1   | DC Power Supply | NGSM 32/10       | 192.0810.31      | Rohde&Schwarz |
| 2   | TSR-USB-Adapter | 20700            | 4515X0001        | FSM AG        |

### List of support devices

| No. | Description                         | Type designation | Serial no. or ID | Manufacturer |
|-----|-------------------------------------|------------------|------------------|--------------|
| 1   | Notebook (for Configuration of EUT) | NA               | NA               | NA           |
| 2   | TSR-USB-Adapter                     | 20700            | 4515X0001        | FSM AG       |

<sup>2</sup> Ports shall be classified as ac power, dc power or signal/control port.

## 5 Referenced Regulations

| <i>European publication</i> | <i>International publication</i> | <i>Title</i>                                                                                                                                         |
|-----------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| ---                         | CFR 47 Pt.1.1310                 | Code of Federal Regulations - Radiofrequency radiation exposure limits.                                                                              |
| ---                         | Health Canada Safety Code 6      | Safety Code 6: Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz - Safety Code 6 (2015) |

## 6 Measurement Uncertainty Values

| Radio Interference Emission Testing                              |       |                      |      |
|------------------------------------------------------------------|-------|----------------------|------|
| Test                                                             | $k_p$ | Expanded Uncertainty | Note |
| Conducted Voltage Emission                                       |       |                      |      |
| 9 kHz to 150 kHz (50 $\Omega$ /50 $\mu$ H V-NetznachbildungAMN)  | 2     | $\pm 3.8$ dB         | 1    |
| 150 kHz to 30 MHz (50 $\Omega$ /50 $\mu$ H V-NetznachbildungAMN) | 2     | $\pm 3.4$ dB         | 1    |
| 100 kHz to 200 MHz (50 $\Omega$ /5 $\mu$ H NetznachbildungAMN)   | 2     | $\pm 3.6$ dB         | 1    |
| Discontinuous Conducted Emission                                 |       |                      |      |
| 9 kHz to 150 kHz (50 $\Omega$ /50 $\mu$ H V-NetznachbildungAMN)  | 2     | $\pm 3.8$ dB         | 1    |
| 150 kHz to 30 MHz (50 $\Omega$ /50 $\mu$ H V-NetznachbildungAMN) | 2     | $\pm 3.4$ dB         | 1    |
| Conducted Current Emission                                       |       |                      |      |
| 9 kHz to 200 MHz                                                 | 2     | $\pm 3.5$ dB         | 1    |
| Magnetic Fieldstrength                                           |       |                      |      |
| 9 kHz to 30 MHz (with loop antenna)                              | 2     | $\pm 3.9$ dB         | 1    |
| 9 kHz to 30 MHz (large-loop antenna 2 m)                         | 2     | $\pm 3.5$ dB         | 1    |
| Radiated Emission                                                |       |                      |      |
| Test distance 3 m                                                |       |                      |      |
| 30 MHz to 300 MHz                                                | 2     | $\pm 4.9$ dB         | 1    |
| 300 MHz to 1 GHz                                                 | 2     | $\pm 5.0$ dB         | 1    |
| 1 GHz to 6 GHz                                                   | 2     | $\pm 4.6$ dB         | 1    |
| Test distance 10 m                                               |       |                      |      |
| 30 MHz to 300 MHz                                                | 2     | $\pm 4.9$ dB         | 1    |
| 300 MHz to 1 GHz                                                 | 2     | $\pm 4.9$ dB         | 1    |
| Radio Interference Power                                         |       |                      |      |
| 30 MHz to 300 MHz                                                | 2     | $\pm 3.5$ dB         | 1    |
| Harmonic Current Emissions                                       |       |                      | 4    |
| Voltage Changes, Voltage Fluctuations and Flicker                |       |                      | 4    |

| Immunity Testing                                         |       |                      |      |
|----------------------------------------------------------|-------|----------------------|------|
| Test                                                     | $k_p$ | Expanded Uncertainty | Note |
| Electrostatic Discharges                                 |       |                      | 4    |
| Radiated RF-Field                                        |       |                      |      |
| Pre-calibrated field level                               | 2.05  | +21.9 / -18.0 %      | 3    |
| Dynamic feedback field level                             | 2.05  | +21.2 / -17.5 %      | 3    |
| Electrical Fast Transients (EFT) / Bursts                |       |                      | 4    |
| Surges                                                   |       |                      | 4    |
| Conducted Disturbances, induced by RF-Fields             | 2     | +30.3 / -23.2 %      | 2    |
| Power Frequency Magnetic Field                           | 2     | +20.7 / -17.1 %      | 2    |
| Pulse Magnetic Field                                     |       |                      | 4    |
| Voltage Dips, Short Interruptions and Voltage Variations |       |                      | 4    |
| Oscillatory Waves                                        |       |                      | 4    |
| Conducted Low Frequency Disturbances                     |       |                      |      |
| Voltage setting                                          | 2     | ± 0.9 %              | 2    |
| Frequency setting                                        | 2     | ± 0.1 %              | 2    |
| Electrical Transient Transmission in Road Vehicles       |       |                      | 4    |

**Note 1:**

The expanded uncertainty reported according to CISPR 16-4-2:2003-11 is based on a standard uncertainty multiplied by a coverage factor of  $k_p = 2$ , providing a level of confidence of  $p = 95.45\%$

**Note 2:**

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of  $k_p = 2$ , providing a level of confidence of  $p = 95.45\%$

**Note 3:**

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of  $k_p = 2.05$ , providing a level of confidence of  $p = 95.45\%$

**Note 4:**

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence.

## 6.1 Electromagnetic Fields Test

### 6.1.1 Test Equipment List

| Type                                                     | Designation | Inv.-no. | Manufacturer |
|----------------------------------------------------------|-------------|----------|--------------|
| <input checked="" type="checkbox"/> Radiation Meter      | EMR 200     | 19590    | Narda        |
| <input checked="" type="checkbox"/> Electric Field Probe | Type 9.2    | 19743    | Narda        |

### 6.1.2 Test Results

Results for electromagnetic fields test are documented as listed below.

## RF Exposure Assessment

|                           |                   |
|---------------------------|-------------------|
| Prüfdatum / Date of test: | 2018-04-25        |
| Prüfer / Operator:        | Matthias Stumpe   |
| Messplatz / Test site:    | Non shielded room |

| Prüfergebnis / Test Result          |                            |
|-------------------------------------|----------------------------|
| <input checked="" type="checkbox"/> | Erfüllt / Passed           |
| <input type="checkbox"/>            | Nicht erfüllt / Not passed |

Equipment under Test (BLE Module) has been set into continuous transmission mode.

Transmit Power was configured to maximum available level.

Resulting fieldstrength was measured with Electromagnetic Radiation Meter. Radiation Meters field probe was placed as close to BLE module PCB antenna as possible. Field probe housing was contacting PCB antenna during test.

| Frequency of Emission       | Test Distance                                                            | Maximum measured Exposure Level | Exposure Limit                             | Limit acc. to                                          | Result |
|-----------------------------|--------------------------------------------------------------------------|---------------------------------|--------------------------------------------|--------------------------------------------------------|--------|
| 2402 MHz<br>(minimum freq.) | 0 mm<br>(Field probe housing directly contacting BLE Module PCB antenna) | 4.88 V/m                        | 61.4 V/m                                   | Health Canada Safety Code 6, Table 5 (General Public)  | PASS   |
|                             |                                                                          | 0.054 W/m <sup>2</sup>          | 1 mW/cm <sup>2</sup> = 10 W/m <sup>2</sup> | Health Canada Safety Code 6, Table 5, (General Public) | PASS   |
|                             |                                                                          | 0.054 W/m <sup>2</sup>          | 1 mW/cm <sup>2</sup>                       | CFR 47 Pt.1.1310(e), Table 1, (General Population)     | PASS   |
| 2480 MHz<br>(maximum freq.) |                                                                          | 5.02 V/m                        | 61.4 V/m                                   | Health Canada Safety Code 6, Table 5 (General Public)  | PASS   |
|                             |                                                                          | 0.058 W/m <sup>2</sup>          | 1 mW/cm <sup>2</sup> = 10 W/m <sup>2</sup> | Health Canada Safety Code 6, Table 5, (General Public) | PASS   |
|                             |                                                                          | 0.058 W/m <sup>2</sup>          | 1 mW/cm <sup>2</sup> = 10 W/m <sup>2</sup> | CFR 47 Pt.1.1310(e), Table 1, (General Population)     | PASS   |

### SAR Exemption acc. to RSS-102 clause 2.5.1.

Maximum Radiated Power P<sub>max</sub> (EIRP) has been tested as follows:

P<sub>max</sub> = 2.13 dBm = 1.63 mW (at 2480 MHz, at 20°C, see test report TR-65350-25670-01 (FCC))

According to RSS-102 (chapter 2.5.1, Table 1) the SAR evaluation exemption limit for frequencies less than 3500 MHz and separation distance of less or equal to 5 mm is 2 mW.

Hence no SAR evaluation is required for the above specified Equipment under Test (BLE Module).

## 7 Revision History

| Revision History |             |                  |                                                                                            |
|------------------|-------------|------------------|--------------------------------------------------------------------------------------------|
| <i>Edition</i>   | <i>Date</i> | <i>Issued by</i> | <i>Modifications</i>                                                                       |
| 1                | 2018-04-25  | M.Stumpe         | First Edition                                                                              |
| 2                | 2018-05-18  | M.Stumpe         | SAR Exemption confirmation in accordance to RSS-102 clause 2.5.1 has been added to report. |