EMI – TEST REPORT

- Human Exposure -

Type / Model Name	:	VIB 5.200
Product Description	:	Vibration meter
Applicant	:	PRÜFTECHNIK Condition Monitoring GmbH
Address	:	Oskar-Messter-Straße 19-21
		85737 ISMANING, GERMANY
Manufacturer	:	PRÜFTECHNIK Condition Monitoring GmbH
Address	:	Oskar-Messter-Straße 19-21
		85737 ISMANING, GERMANY

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

Test Report No. : T42136-02-07GK	16. February 2018 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.

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**.

OET Bulletin 65, 65A, 65B Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

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

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – See ATTACHMENT A

2.2 Equipment type, category

Portable equipment

2.3 Short description of the equipment under test (EUT)

The EUT is a vibration meter with four integrated radio technologies (NFC, Bluetooth, Bluetooth low energy and WLAN). The Vibscanner 2 has two integrated radio modules. One module provides NFC and the other provides Bluetooth, BLE and WLAN. Only one out of these three technologies (Bluetooth, BLE and WLAN) can be active at the same moment. Bluetooth and BLE is working in the transmission gaps of WLAN.WLAN has the highest power. With regard to human exposure considerations over 6 minutes the worst case combination is NFC working together with WLAN and Bluetooth.

Number of tested samples	:	1
Serial number	:	5200 0055
Firmware version	:	0.87

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

2.4 Variants of the EUT

None

2.5 Operation frequency

NFC is working at 13.56 MHz

Bluetooth and BLE are working in the 2400 to 2483.5 MHz range

WLAN is working in the 2400 to 2483.5 MHz range and in the 5150 to 5725 MHz range

2.6 Antennas

The following antennas shall be used with the EUT:
NFC uses an integrated antenna

Bluetooth, BLE and WLAN use the same integrated antenna:
Antenova A10194

Gain in the 2.4 GHz range:	1.8 dBi
Rain in the 5 GHz range:	4.1 dBi

2.7 Power supply system utilised

Power supply voltage	:	7.2 V DC (battery powered)

Mains adaptor:

Power supply voltage	:	100 V – 240 V AC / 50 Hz – 60 Hz (output 12 V DC)

2.8 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- NFC tag Model : Supplied by the manufacturer
- _____ Model : _____

2.9 Final measurement conditions

The tests are carried out in the following frequency band:
13.56 MHz

2400 MHz – 2483.5 MHz and 5150 - 5.725 MHz

2.9.1 Test jig

None

2.9.2 Test software

Labtool

3 TEST RESULT SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
15.247(i)	RSS 102, 2.5.2	MPE	not applicable
KDB 447498	RSS 102, 2.5.1	SAR exclusion consideration	passed
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 : 12 February 2018

Testing concluded on : 12 February 2018

Checked by:

Thomas Weise
Ich bestätige die Genauigkeit und Richtigkeit des Dokuments
2018.02.16 10:43:24 +01'00'

Thomas Weise
Laboratory Manager

Tested by:

Konrad Grassl
I am the author of this document
2018.02.16 10:21:26 +01'00'

Konrad Graßl
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

4.4 Measurement protocol for FCC and ISED

4.4.1 General information

The Open Area test site is a listed Open Site under the Canadian Test-Sites File-No:

IC 3009A-1

The Anechoic chamber is a listed test site under the Canadian Test-Sites File-No:

IC 3009A-2

In compliance with RSS 247 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.10 and applying the CISPR 22 limits.

5 TEST CONDITIONS AND RESULTS

5.1 Output power

NFC: The result of the fieldstrength is taken of the test report T42136-02-06GK of the test laboratory CSA Group Bayern GmbH.

Measurement result at 3 m measurement distance

Frequency (MHz)	Level (dBµV)	Corr. factor (dB)	Corr. Level dB(µV/m)
13.56	38.8	20.5	59.3

Calculated power = 59.3 dB(µV/m) – 95.2 = -35.9 dBm = 0.00026 mW

WLAN, Bluetooth, Bluetooth low energy:

There is an existing RF exposure report of the test laboratory 7 layers with the number: MDE-UBLOX-1551_MPEa. This report shows that in respect of the human exposure the worst combination of the RF technologies is the combination of WLAN with Bluetooth. The report shows the rated power (including tune-up tolerance) and the gain of the antenna.

Integrated antenna: Antenova A10194
Gain in the 2.4 GHz range: 1.8 dBi
Rain in the 5 GHz range: 4.1 dBi

Worst case channels:

Bluetooth: rated power with included tune-up tolerance: **9.4 dBm**

WLAN: 2437 MHz Modulation b: rated power with included tune-up tolerance: **18 dBm:** with gaps: **15 dBm** (note)

WLAN: 5260 MHz Modulation a: rated power with included tune-up tolerance: **17 dBm:** with gaps: **11.5 dBm** (note)

Note: The manufacturer programs gaps in the WLAN transmission so that the average power of the transmission will be reduced by 3 dB (duty cycle of 50 %) in the 2.4 GHz range and by 5.5 dB (duty cycle of 28.2 %).

Remarks: _____

_____

6 HUMAN EXPOSURE

6.1 Maximum permissible exposure (MPE)

Remarks: Not applicable because the distance between the EUT and the user is below 20 cm.

6.2 SAR test exclusion considerations

6.2.1 Applicable standard

According to RF exposure guidance:
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.

6.2.2 Determination of the standalone SAR test exclusion threshold

Note: In normal use the device is a handheld device. In the delivery scope of the manufacturer there is also a carrier bag therefore the EUT is also a body worn equipment. This is the worst case with respect to human exposure.

Separation distance between the NFC antenna and the user is below 5 mm. (worst case calculation)

Separation distance between the WLAN, BT, BLE antenna and the user is below 27 mm.

NFC:

Channel frequency (MHz)	EIRP (dBm)	EIRP (mW)	Limit SAR mW	Percentage %
13.56	-35.9	0.00026	442.65	0.00006

Bluetooth:

Separation distance (mm)	Channel frequency (MHz)	rated power + tolerance (dBm)	rated power + tolerance (mW)	1-g SAR	Limit 1-g SAR	Percentage %
27	2441	9.4	8.71	0.50	3.0	16.8

WLAN 2.4 GHz:

Separation distance (mm)	Channel frequency (MHz)	rated power + tolerance (dBm)	rated power + tolerance (mW)	1-g SAR	Limit 1-g SAR	Percentage %
27	2437	15.0	31.62	1.83	3.0	60.9

WLAN 5 GHz:

Separation distance (mm)	Channel frequency (MHz)	rated power + tolerance (dBm)	rated power + tolerance (mW)	1-g SAR	Limit 1-g SAR	Percentage %
27	5260	11.5	14.13	1.20	3.0	40.0

Conclusion: SAR measurement is not necessary.

6.2.3 Determination of the SAR test exclusion threshold for simultaneous transmission

Bluetooth is working in the transmission gaps of WLAN. According to item 6.2.2 the worst case combination is NFC + Bluetooth + WLAN 2.4 GHz

Sum of the percentage of the limit of the worst case combination:

NFC + Bluetooth + WLAN 2.4 GHz = 0.00006 % + 16.8 % + 60.9 % = 77.7 %

Conclusion: The Threshold level is smaller than the limit, SAR measurement is not necessary.

The requirements are **FULFILLED.**

Remarks: _____

_____

6.3 Exemption limits for routine evaluation - SAR evaluation

6.3.1 Applicable standard

According to RSS-102, item 2.5.1:
SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance (Note 4 and 5)

Frequency (MHz)	**Exemption Limits (mW)**				
	At separation distance of ≤5 mm	**At separation distance of 10 mm**	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤ 300	**71 mW**	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	**52 mW**
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	**Exemption Limits (mW)**				
	At separation distance of 30 mm				
≤ 300	223 mW				
450	141 mW				
835	80 mW				
1900	99 mW				
2450	**83 mW**				
3500	86 mW				
5800	56 mW				

4 The exemption limits in Table 1 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.
5 Transmitters operating between 0.003-10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in Section 4.

6.3.2 Cunclusion according RSS-102.

NFC:

Channel frequency (MHz)	EIRP (dBm)	EIRP (mW)	Limit SAR mW	Percentage %
13.56	-35.9	0.00026	66.30	0.00039

Bluetooth:

Separation distance (mm)	Channel frequency (MHz)	rated power + tolerance + gain (dBm)	rated power + tolerance + gain (mW)	Limit 1-g SAR (mW)	Percentage %
27	2441	11.2	13.18	64.4	20.5

WLAN 2.4 GHz:

Separation distance (mm)	Channel frequency (MHz)	rated power + tolerance + gain (dBm)	rated power + tolerance + gain (mW)	Limit 1-g SAR (mW)	Percentage %
27	2437	16.8	47.86	64.4	74.3

WLAN 5 GHz:

Separation distance (mm)	Channel frequency (MHz)	rated power + tolerance + gain (dBm)	rated power + tolerance + gain (mW)	Limit 1-g SAR (mW)	Percentage %
27	5260	15.6	36.31	47.0	77.3

For Bluetooth and WLAN the limit was interpolated.

For the EUT a SAR measurement is NOT necessary

6.3.3 Determination of the SAR test exclusion threshold for simultaneous transmission

Bluetooth is working in the transmission gaps of WLAN. According to item 6.2.2 the worst case combination is NFC + Bluetooth + WLAN 2.4 GHz

Sum of the percentage of the limit of the worst case combination:

NFC + Bluetooth + WLAN 5 GHz = 0.00039 % + 20.5 % + 77.3 % = 97.8 %

Conclusion: The Threshold level is smaller than the limit, SAR measurement is not necessary.

The requirements are **FULFILLED.**

Remarks: _____

_____