



RF - TEST REPORT
- Human Exposure -

Type / Model Name : HPR-SB02

Product Description : BLE / ANT+ Gateway for TQ HPR eBike systems

Applicant : TQ-Systems GmbH

Address : Gut Delling, Muehlstrasse 2
82229 SEEFELD

Manufacturer : TQ-Systems GmbH

Address : Gut Delling, Muehlstrasse 2
82229 SEEFELD

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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Test Report No. : 80269491-01 Rev_1	23. January 2026 Date of issue
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ATTACHMENT A as separate supplement

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations:

Part 1, Subpart I, Section 1.1310

Radiofrequency radiation exposure limits

Part 1, Subpart J, Section 2.1093

Radiofrequency radiation exposure evaluation: **portable devices.**

KDB 447498 D01 V06

General RF Exposure Guidance

RSS-102, Issue 6

**Radio Frequency (RF) Exposure Compliance of
Radiocommunication Apparatus (All Frequency Bands)**

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 Photo documentation of the EUT – See ATTACHMENT A

2.4 Equipment type

BLE device
ANT+ device

2.5 Short description of the equipment under test (EUT)

The device functions as a Bluetooth / ANT+ gateway for TQ HPR eBike systems. It is required to ensure full system functionality when the TQ eBike system is operated in combination with an OEM-specific display and remote control.

Number of tested samples	:	1 (radiated sample)	1 (conducted sample)
Serial number	:	HPR-SB02_RAD_DTM01	HPR-SB02_CON_DTM02
Firmware number	:	Hpr-sb02.DTM_FW	Hpr-sb02.DTM_FW

FCC ID : 2ANFF-Q105
IC ID : 23072-Q105
HVIN: HPR-SB02

Items	Description
Technology type	Bluetooth Low Energy (BLE), ANT+
Chipset type	Nordic Semiconductor nRF52832, ARM Cortex-M4F
Modulation	GFSK
Frequency range	2400 MHz to 2483.5 MHz
Channel numbers	40
Data rate (Mbps)	1 Mbps, 0.025 Mbps
Power setting	4 dBm
Antenna type	Integrated PCB antenna (on-board)

2.6 Variants of the EUT

There is a variant of the HPR-SB02 (HVIN: HPR-SB02), designated HPR-SB02-A (HVIN: HPR-SB02-A), which does not include the integrated SmartBox power outputs. The internal hardware design is identical according to the manufacturer, with the exception that the components for the power output stage are not populated. The RF section is fully identical across both variants according to the manufacturer.

2.7 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan:

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

Note: the marked frequencies are determined for final testing.

Channel frequency ANT+: 2458 MHz

2.8 Transmit operating modes

The EUT uses GFSK modulation and may provide following data rates:

- 1 Mbps for BLE
- 0.025 Mbps for ANT+

(Mbps = Megabits per second)

2.9 Antennas

The following antennas shall be used with the EUT:

Number	Characteristic	Name	Frequency band (GHz)	Gain (dBi)
1	omnidirectional	Internal PCB antenna	2.4 – 2.5	-1.7

2.10 Power supply system utilised

Power supply voltage, V_{nom} : 13.2 V/DC

3 TEST RESULT SUMMARY

Operating in the 2400 MHz – 2483.5 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
KDB 447498, 7.1	RSS 102, 6.6	MPE	not applicable
KDB 447498, 4.3.1	RSS 102, 6.3	SAR exclusion consideration	passed
KDB 447498, 7.2	RSS102, 7.1.5	Co-location, Co-transmission	not applicable

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80269491-01	0	19 January 2026	Initial test report
80269491-01	1	23 January 2026	Separation distance corrected

The test report with the highest revision number replaces the previous test reports.

3.2 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 : 03 November 2025

Testing concluded on : 28 November 2025

Checked by:

Jürgen Pessinger
**Jürgen
Pessinger**
 2026.01.23
 10:57:10 +01'00'

 Jürgen Pessinger
 Teamleader Radio

Tested by:

C. Thaller
**Christopher
Thaller**
 2026.01.23
 10:39:22 +01'00'

 Christopher Thaller
 Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Straubinger Straße 100
94447 PLATTILING
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 on basis of the ETSI Technical Report TR 100 028 Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1 and Part 2. The results are documented in the quality system acc. to DIN EN ISO/IEC 17025. 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.

4.4 Conformity Decision Rule

The applied conformity decision rule is based on ILAC G8:09/2019 clause 4.2.1 Binary Statement for Simple Acceptance Rule ($w = 0$).

Details can be found in the procedure CSA_B_V50_29.

5 HUMAN EXPOSURE

5.1 SAR test exclusion considerations

5.1.1 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.

5.1.2 Determination of the standalone SAR test exclusion threshold

The minimum separation distance results from the application of the EUT. This distance is assumed to 50 mm from antenna to the user.

The formula under 4.3.1 1) for 100 MHz to 6 GHz for standalone equipment is used:

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})]^{*}[\sqrt{f(\text{GHz})}]$$

The max power is:

Rated output power:	2.6 mW	4.1 dBm
Tune-up tolerance:	2.0 dB	
Maximum output power:	6.1 dBm	4.1 mW
Antenna gain max:	-1.7 dBi	
Maximum EIRP:	4.4 dBm	2.8 mW
Minimum distance r:	50.0 mm	

Channel frequency (MHz)	A (mW)	Threshold level	Limit 1g	Limit 10g	Margin 1g	Margin 10g
2405	3.6	0.11	3.0	7.5	-2.9	-7.4
2440	3.9	0.12	3.0	7.5	-2.9	-7.4
2480	4.0	0.13	3.0	7.5	-2.9	-7.4
2458	4.1	0.13	3.0	7.5	-2.9	-7.4

For the EUT SAR measurement is NOT necessary.

The requirements are **FULFILLED**.

Remarks:

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5.2 Exemption limits for routine evaluation - SAR evaluation

5.2.1 Applicable standard

According to RSS-102, item 6.3:

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
4, 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	45	116	139	163	189
450	32	71	87	104	124
835	21	32	41	54	72
1900	6	10	18	33	57
2450	3	7	16	32	56
3500	2	6	15	29	50
5800	1	5	13	23	32

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤ 300	216	246	280	319	362
450	147	175	208	248	296
835	96	129	172	228	298
1900	92	138	194	257	323
2450	89	128	170	209	245
3500	72	94	114	134	158
5800	41	54	74	102	128

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.

5.2.2 Conclusion according RSS-102.

Rated output power:	2.6 mW	4.1 dBm
Tune-up tolerance:	2.0 dB	
Maximum output power:	6.1 dBm	4.1 mW
Antenna gain max:	-1.7 dBi	
Maximum EIRP:	4.4 dBm	2.8 mW
Minimum distance r:	50.0 mm	

Maximum output power at 2458 MHz, **4.1 mW** is < 245 mW;

For the EUT SAR measurement is NOT necessary.

The requirements are **FULFILLED**.

Remarks:

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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.