



RF - TEST REPORT
- Human Exposure -

Type / Model Name : HPR Display V04

Product Description : Central control unit of e-bike system

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. : 80237318-04 Rev_1	11. November 2025 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 - 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.
ANSI C95.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
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 to 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 EUT "HPR Display V04" is a Bluetooth Low Energy wireless bike computer. It is the central control and information unit of the TQ HPR e-bike system. The modulation used by the EUT is GFSK.

Number of tested samples	:	1 (radiated sample)	1 (conducted sample)
Article number	:	356974.0100	356974.0100
Serial number	:	20240819/00104/23#	20240819/00056/23#
Firmware number	:	1.0.0	1.0.0
Name of sample	:	HPR-DISP04-CON-RAD-005	HPR-DISP04-CON-SMA-003

FCC ID : 2ANFF-Q104
 IC ID : 23072-Q104
 HVIN : HPR DISPLAY V04

Items	Description
BT type	5.4 Low Energy
BT chipset type	nRF 52840
Modulation	GFSK
Frequency range	2400 MHz to 2483.5 MHz
Channel numbers	40
Data rate (Mbps)	1
Power setting	Default (0)
Antenna type	PCB

2.6 Variants of the EUT

There are no variants.

2.7 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

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

Note: the marked frequencies are determined for final testing.

Channel frequency ANT+: 2457 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:

A single PCB antenna is used within the system. The EUT has only one integrated antenna.

Number	Characteristic	Frequency band (GHz)	Gain (dBi)
1	omnidirectional	2.4 – 2.5	- 13.2

2.10 Power supply system utilised

Power supply voltage, V_{nom} : 13.3 V_{DC}

3 TEST RESULT SUMMARY

BLE and ANT+ device using digital modulation 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
80237318-04	0	03 April 2025	Initial test report
80237318-04	0	11 November 2025	Antenna data corrected

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

3.2 Final assessment

The equipment under test fulfils the requirements cited in clause 1 test standards.

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

Testing commenced on : 13 March 2025

Testing concluded on : 28 March 2025

Checked by:

Jürgen Pessinger
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Pessinger**
2025.11.12
11:53:04 +01'00'

Jürgen Pessinger
Radio Team

Tested by:

C. Thaller
**Christopher
Thaller**
2025.11.11
12:44:02 +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 TEST CONDITIONS AND RESULTS

5.1 RF output power

5.1.1 Test result

The output power of the device is taken from the power measurement in the test report 80237318-03 issued by CSA Group Bayern:

Conducted Measurement					
FCC §15.247 (b)(3) RSS-247 6.3.2					
Modulation	Channel	Frequency	Measured Conducted TX Power	Conducted Tx-Power Limit	Margin
		MHz	dBm	dBm	dB
BLE 1 Mbps	CH37	2402	-2.2	30.0	-32.2
	CH18	2442	-2.2	30.0	-32.2
	CH39	2480	-2.3	30.0	-32.3
ANT+ 25 kbps	ANT+	2457	-2.4	30.0	-32.4

Remarks: As worst case the power values are not averaged over time.

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.

6 HUMAN EXPOSURE

6.1 FCC SAR test exclusion considerations

6.1.1 Applicable standard

According to RF exposure guidance KDB 447498 D01 V06:

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.

6.1.2 Determination of the standalone SAR test exclusion threshold

For BLE and ANT+ device:

The minimum separation distance results from the application of the HPR Display V04 which is handled by hand. This distance is assumed to 5 mm from antenna to the hand of the user.

The hand of the user is the nearest extremity of a human being therefore the threshold for 10-g is determined.

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

$$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 7.5;$$

The max conducted power is:

Rated output power:	0.6 mW	-2.2 dBm
Tune-up tolerance:	2.00 dB	
Maximum output power:	-0.2 dBm	1.0 mW
Antenna gain max:	-13.2 dBi	
Maximum EIRP:	-13.4 dBm	0.0 mW
Minimum distance r:	5.0 mm	

Channel frequency (MHz)	A (mW)	Threshold level	Limit 1g	Limit 10g	Margin 1g	Margin 10g
2402	1.0	0.31	3.0	7.5	-2.7	-7.2
2442	1.0	0.31	3.0	7.5	-2.7	-7.2
2480	0.9	0.28	3.0	7.5	-2.7	-7.2
2457	0.9	0.28	3.0	7.5	-2.7	-7.2

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

The requirements are **FULFILLED**.

Remarks:

-

6.2 ISED Exemption limits for routine evaluation - SAR evaluation

6.2.1 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.

6.2.2 Conclusion according to RSS-102

Rated output power:	0.6 mW	-2.2 dBm	
Tune-up tolerance:	2.00 dB		
Maximum output power:	-0.2 dBm	1.0 mW	
Antenna gain max:	-13.2 dBi		
Maximum EIRP:	-13.4 dBm	0.0 mW	
Minimum distance r:	5.0 mm		

Maximum output power at 2450 MHz, **1 mW** is < 3 mW;

For the EUT SAR measurement is NOT necessary.

The requirements are **FULFILLED**.

Remarks: -
