



RF - TEST REPORT

- Human Exposure -

Type / Model Name : RR03

Product Description : Active Timing System

Applicant : race result AG

Address : Joseph-von-Fraunhofer-Straße 11
76327 Pfinztal, Germany

Manufacturer : race result AG

Address : Joseph-von-Fraunhofer-Straße 11
76327 Pfinztal, Germany

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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Test Report No. : 80149824-05 Rev_2	15. May 2023 Date of issue
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Deutsche
Akkreditierungsstelle
D-PL-12030-01-03
D-PL-12030-01-04

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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	RF Exposure procedures and equipment authorisation policies for mobile and portable devices, April 20, 2021.
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 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 General remarks

None.

2.4 Photo documentation of the EUT – Detailed photos see attachment A

2.5 Equipment category

EUT is a low power 2.4 GHz transceiver.

2.6 Short description of the equipment under test (EUT)

The active timing system is used for time measurements in sport events and consists of the RR02 (base station) and the RR03 (transponder). RR02 and a 125 kHz loop antenna is placed on the time measurement position. The RR03 is attached to the participant of the event or their equipment. The 125 kHz signal triggers a 2.4 GHz transmission between the RR02 and the RR03. This message contains the required information and is stored. The functions of the RR03 are controlled by the 125 kHz signal of the RR02.

Number of tested samples: 2
 Serial number: ZZZZZ107 (Radiated sample, external power supply)
 ZZZZZ67 (Conducted sample, external power supply)

2.7 Variants of the EUT

There are no variants.

2.8 Operation frequency and channel plan

The operating frequency band is 2400 MHz to 2483.5 MHz.

Main		Backup	
Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2480	8	2410
1	2405	9	2470
2	2425	10	2465
3	2475	11	2440
4	2415	12	2445
5	2460	13	2430
6	2435	14	2455
7	2450	15	2420

2.9 Transmit operating modes

The EUT allows free selection of main channel and following transmit modes:

- TX continuous, unmodulated
- Communication, modulated

2.10 Antenna

The internal custom PCB antenna is not accessible for the end user. It has a max. gain of 0 dBi +/-1 dB.

2.11 Power supply system utilised

Power supply voltage, V_{nom} : 3 V_{DC} (Battery)

For testing purposes a modified sample with external power supply is used.

2.12 Peripheral devices and interface cables

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

- Power supply cables _____ Model : 1 m _____

2.13 Determination of worst-case conditions for final measurement

Preliminary tests were performed to find the worst-case mode where the maximum emissions occur. The maximum output power is set while testing.

For the final test, the following channels and test modes are selected:

Available channels	Tested channels	Power setting	Modulation	Modulation type	Data rate
1 to 15	0, 1, 7	default	O-QPSK	Digital QPSK	250 kbit/s

2.13.1 Test jig

No test jig used.

2.13.2 Test software

EUT is controlled by 125 kHz signal from companion device. Companion device is controlled by HTerm terminal software.

3 TEST RESULT SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
KDB 447498, 7.1	RSS 102, 2.5.2	MPE	not applicable
KDB 447498, 4.3.1	RSS 102, 2.5.1	SAR exclusion consideration	passed
KDB 447498, 7.2	RSS102, 3.2	Co-location, Co-transmission	not applicable

The mentioned RSS Rule Parts in the above table are related to:
RSS 102, Issue 5, March 2015

MPE is not applicable. EUT operates < 20 cm to the body of the user.

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80149824-05	0	09 March 2023	Initial test report
80149824-05	1	04 May 2023	Added picture to clarify distance of radiating structure to human body
80149824-05	2	15 May 2023	Clarified test separation distance of 5.1 and limit of 5.2

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 : 09 February 2023

Testing concluded on : 09 February 2023

Checked by:

Tested by:

Jürgen Pessinger
Radio Team

Lukas Scheuermann
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 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.

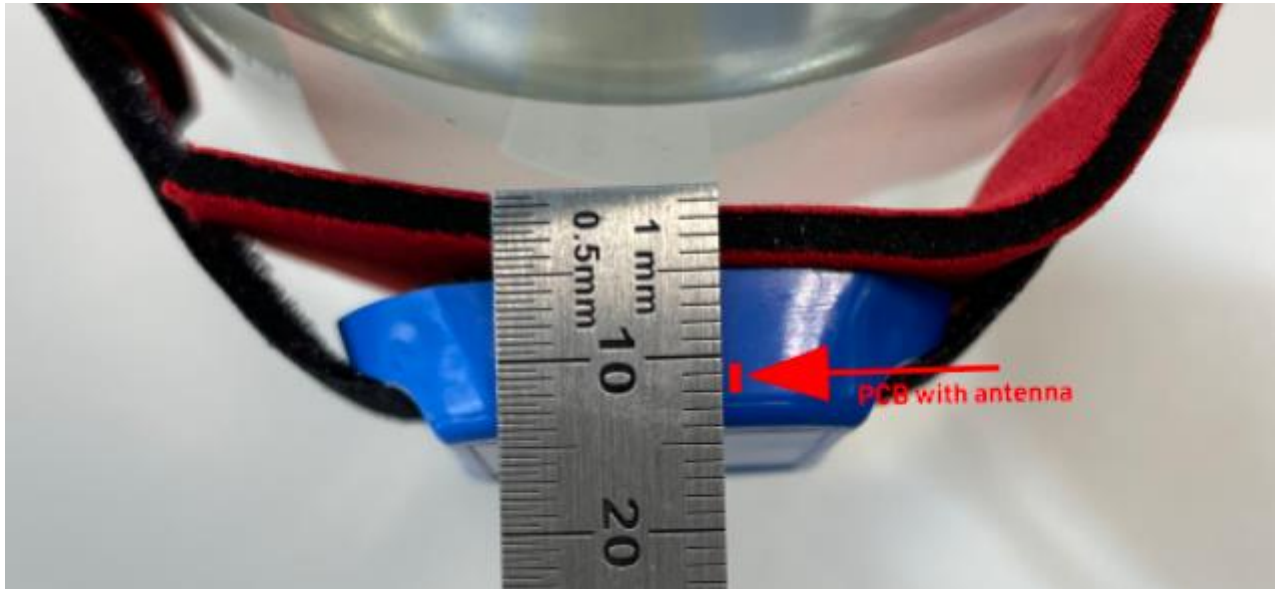
5.1.2 Determination of the standalone SAR test exclusion threshold

This minimum distance is assumed to ≤ 50 mm from antenna to the body of the user.

The Limbs of the user are the nearest extremity of a human being therefore the threshold for 10-g is determined with separation distance of 10 mm.

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

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



A: Maximum measured power
 Tune Up Tolerance: 1 dB
 min. test separation distance: 10 mm (Human body to radiating structure)
 5 mm (Human body to device)

Channel frequency (MHz)	A (mW)	A+Tuneup (mW)	Threshold level	Limit 1g	Limit 10g	Margin 1g	Margin 10g
2405	4.4	5.6	0.86	3.0	7.5	-2.1	-6.6
2450	3.6	4.6	0.57	3.0	7.5	-2.4	-6.9
2480	2.8	3.5	0.44	3.0	7.5	-2.6	-7.1

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

Remarks: Power values are according to CSA Test Report 80149824-04.

5.2 Exemption limits for routine evaluation - SAR evaluation

5.2.1 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 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	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	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	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	88 mW	195 mW	213 mW
835	80 mW	92 mW	177 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 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.

5.2.2 Conclusion according RSS-102

For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5.

Maximum output power at 2450 MHz, 4.6 mW is $< 17.5 \text{ mW} (= 7 \text{ mW} * 2.5)$

For the EUT is SAR measurement is NOT necessary

Remarks: Power values are according to CSA Test Report 80149824-04.
