



RF – TEST REPORT

- Human Exposure -

Type / Model Name : KINEXON Handheld Tag / T010002

Product Description : Tracking tag for an UWB localization system

Applicant : KINEXON Inc.

Address : 200 S Wacker Drive, Suite 3100

CHICAGO, IL 60606, USA

Manufacturer : KINEXON GmbH

Address : Schellingstr.35

80799 MÜNCHEN, GERMANY

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

POSITIVE

Test Report No. : 80202487-07 Rev1

14. August 2024

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-00

FCC ID: 2ALC5-KNX-HTAG2

IC: 25557-KNXHTAG2

Contents

1	<u>TEST STANDARDS</u>	3
2	<u>EQUIPMENT UNDER TEST</u>	4
2.1	Information provided by the Client	4
2.2	Sampling	4
2.3	Photo documentation of the EUT – See ATTACHMENT A	4
2.4	Equipment type, category	4
2.5	Short description of the equipment under test (EUT)	4
2.6	Variants of the EUT	4
2.7	Operation frequency and channel plan	4
2.8	Transmit operating modes	4
2.9	Antennas	5
2.10	Power supply system utilised	5
3	<u>TEST RESULT SUMMARY</u>	6
3.1	Revision history of test report	6
3.2	Final assessment	6
4	<u>TEST ENVIRONMENT</u>	7
4.1	Address of the test laboratory	7
4.2	Environmental conditions	7
4.3	Statement of the measurement uncertainty	7
4.4	Conformity Decision Rule	7
5	<u>HUMAN EXPOSURE</u>	8
5.1	RF Exposure Test Exemption	8
5.2	Exemption limits for routine evaluation - SAR evaluation	11
6	<u>USED TEST EQUIPMENT AND ACCESSORIES</u>	13

ATTACHMENT A as separate supplement

FCC ID: 2ALC5-KNX-HTAG2

IC: 25557-KNXHTAG2

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 2, Subpart J, Section 2.1091	Radiofrequency radiation exposure evaluation: mobile devices .
Part 2, Subpart J, Section 2.1093	Radiofrequency radiation exposure evaluation: portable devices .
KDB 447498 D01	RF Exposure procedures and equipment authorisation policies for mobile and portable devices
RSS-102 Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication apparatus (All Frequency Bands)

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.

FCC ID: 2ALC5-KNX-HTAG2

IC: 25557-KNXHTAG2

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, category

BLE device, handheld UWB Device, portable equipment

2.5 Short description of the equipment under test (EUT)

KINEXON's real time localization system (RTLS) is designed to provide precise tracking and motion information in sport and industrial environment. Tags are small devices equipped with Ultrawide band (UWB), Bluetooth low energy (BLE) and an inertial measurement unit (IMU).

Number of tested samples: 2
Serial number: 374758 (#UFL_ALOHA_1, cont. Tx on CH3 with typical transmission rate)
374759 (#UFL_ALOHA_2, cont. Tx on CH5 with typical transmission rate)
Firmware version: release/6.11.0

2.6 Variants of the EUT

There are no variants.

2.7 Operation frequency and channel plan

Operating range BLE: 2400 MHz to 2483.5 MHz.
Operating range UWB: 3100 MHz to 4800 MHz and 6000 MHz to 9000 MHz.

2.8 Transmit operating modes

BLE: The EUT uses GFSK modulation and provides a data rate of 1000 kbps.

UWB: The EUT uses PPM modulation with BPSK and provides a data rate of 6.8 Mbps.

FCC ID: 2ALC5-KNX-HTAG2
IC: 25557-KNXHTAG2

2.9 Antennas

BLE

Number	Characteristic	Model number	Plug	Frequency range (GHz)	Gain (dBi)
1	Omni	Internal antenna, N/A	PCB	2.4	-1.0

UWB

Number	Characteristic	Model number	Plug	Frequency range (GHz)	Peak Gain (dBi)
1	Omni	3100AT51A7200	PCB	3.1 – 10.3	1.5

2.10 Power supply system utilised

Power supply voltage, V_{nom} : 3.7 V DC

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.

FCC ID: 2ALC5-KNX-HTAG2
IC: 25557-KNXHTAG2

3 TEST RESULT SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
KDB 447498, 7.1	RSS 102, 2.5.2	MPE	passed
KDB 447498, 4.3.1	RSS 102, 2.5.1	SAR exclusion consideration	not applicable
KDB 447498, 7.2	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 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80202487-07	0	08 May 2024	Initial test report
80202487-07	1	14 August 2024	5.1.4 conclusion 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 : 27 March 2024

Testing concluded on : 27 March 2024

Checked by:

Tested by:

Thomas Weise
Laboratory Manager

Franz-Xaver Schrettenbrunner
Radio Team

FCC ID: 2ALC5-KNX-HTAG2

IC: 25557-KNXHTAG2

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.

FCC ID: 2ALC5-KNX-HTAG2

IC: 25557-KNXHTAG2

5 HUMAN EXPOSURE

5.1 RF Exposure Test Exemption

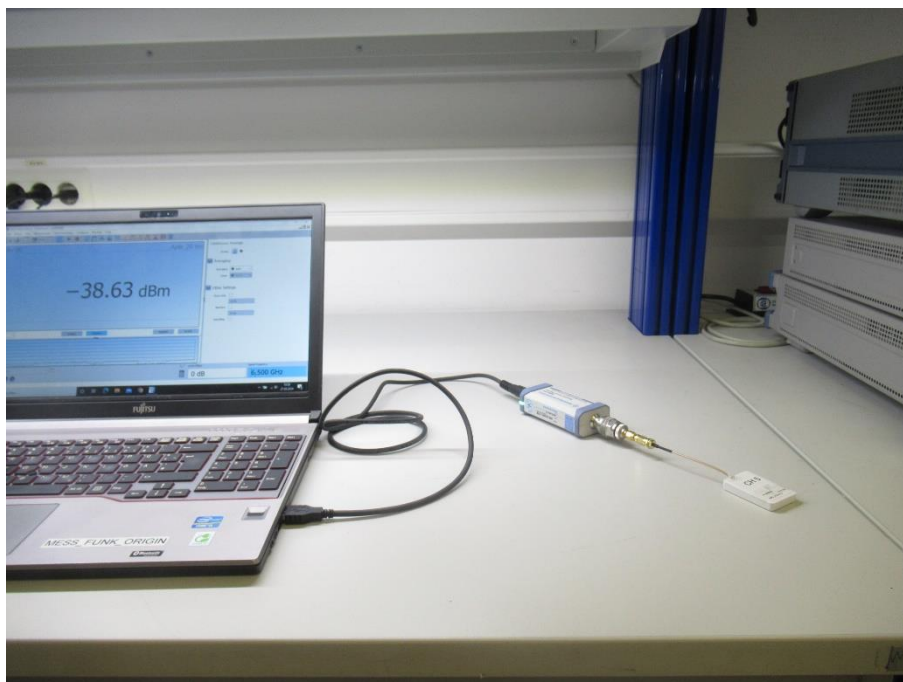
For test instruments and accessories used see section 6 Part HE.

5.1.1 Description of the test location

Test location: Shielded Room S6

5.1.2 Photo documentation of the test set-up

UWB



5.1.3 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.

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.

FCC ID: 2ALC5-KNX-HTAG2

IC: 25557-KNXHTAG2

5.1.4 Determination of the standalone SAR test exclusion thresholdBLE

The maximum radiated output power is taken from the test report 80202487-05 Rev0 of the accredited test laboratory CSA Group Bayern GmbH, Ohmstraße 1-4, 94342 Straßkirchen, Germany.

Frequency (minimum)	2402 MHz	
Max. EIRP	5.9 dBm	P = 3.9 mW
Minimal distance	0.5 cm	

According to KDB 447498 Appendix A, the SAR test exclusion threshold for 5 mm separation and 2450 MHz is given by **10 mW**.

UWB

The maximum conducted output power is measured with a power meter.

Frequency	4500 MHz – 6500 MHz	
P conducted	-38.6 dBm	138.0 nW
Antenna gain	1.5 dBi	
Max. EIRP	-37.1 dBm	P = 195.0 nW
Minimal distance	0.5 cm	

According to KDB 447498 Appendix A, the SAR test exclusion threshold for 5 mm separation and 5800 MHz is given by **6 mW**.

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

FCC ID: 2ALC5-KNX-HTAG2

IC: 25557-KNXHTAG2

5.1.5 Determination of the SAR test exclusion threshold for simultaneous transmission

When both devices are active the max threshold level has to be summed and the total threshold level is determined.

Total power: $3.9 \text{ mW} + 0.000195 \text{ mW} = 3.9 \text{ mW}$

Conclusion: The Threshold level is smaller than the limit, SAR measurement is not necessary. BLE and UWB can be co-located without exceeding SAR limits.

The requirements are **FULFILLED**.

Remarks: None.

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.

FCC ID: 2ALC5-KNX-HTAG2
IC: 25557-KNXHTAG2

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.

FCC ID: 2ALC5-KNX-HTAG2

IC: 25557-KNXHTAG2

5.2.2 Conclusion according to RSS-102.

Maximum output power at 2450 MHz, **3.9 mW** is < 4 mW;

Maximum output power at 5800 MHz, **195 nW** is < 1 mW;

When both devices are active the max threshold level has to be summed and the total threshold level is determined.

Total power: 3.9 mW + 0.000195 mW = 3.9 mW

For the EUT, SAR measurement is NOT necessary.

The requirements are **FULFILLED**.

Remarks: None.

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.

FCC ID: 2ALC5-KNX-HTAG2

IC: 25557-KNXHTAG2

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
HE	NRP18T	02-02/07-19-001	12/09/2024	12/09/2023		

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.