



# RF - TEST REPORT

- Human Exposure -

**Type / Model Name** : KY-LOC 1D.03.01

**Product Description** : Radar sensor

HVIN: 1.1.2.1.1

**Applicant** : Kymati GmbH

**Address** : Am Hochacker 5

85630 GRASBRUNN, GERMANY

**Manufacturer** : Kymati GmbH

**Address** : Am Hochacker 5

85630 GRASBRUNN, GERMANY

<b>Test Result</b> according to the standards listed in clause 1 test standards:	<b>POSITIVE</b>
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<b>Test Report No. :</b> <b>80141961-04 Rev_1</b>	26. April 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.
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
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### **RSS-102, Issue 5, February 2, 2021**

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

ANSI C95.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
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## **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**

The EUT qualifies under FCC 15.255(c)(2) / RSS-210 2.1(a) field disturbance sensor, fixed equipment

### **2.5 Short description of the equipment under test (EUT)**

The EUT is a radar sensor in the operating band 61.0 GHz to 61.5 GHz and 60 GHz to 64 GHz. It determines the distance in primary or secondary radar mode.

Number of tested samples:	1
Serial number:	00009
Firmware ID:	3D.02

### **2.6 Variants of the EUT**

There are no variants of the EUT.

### **2.7 Operation frequency and channel plan**

Operating frequency range 1: 61.0 GHz to 61.5 GHz

Operating frequency range 2: 60.0 GHz to 64.0 GHz.

## 2.8 Transmit operating modes

Two operation modes with two operating frequency ranges are available:

Primary radar mode	0.5 GHz OBW for operating frequency range 1 or 4 GHz OBW for operating frequency range 2, FMCW, passive reflection
Secondary radar mode	0.5 GHz OBW for operating frequency range 1 or 4 GHz OBW for operating frequency range 2, FMCW and FSK (The communication link between device 1 and device 2 uses the FSK), two way ranging, active reflection

## 2.9 Antennas

The following antennas shall be used with the EUT:

- Antenna 0 Integrated patch antenna, 28 dBi.
- Antenna 1 Integrated patch antenna, 28 dBi.
- Antenna 2 Integrated patch antenna, 28 dBi.

The three TX antennas can be used alternating but can not transmit at the same time.

## 2.10 Power supply system utilised

Power supply voltage	:	9 – 36 V/DC
Alternative power supply PoE	:	53.5 V/DC

### **3 TEST RESULT SUMMARY**

Operating in the 61.0 - 61.5 GHz band and in the 57 - 71 GHz band:

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	not applicable

#### **3.1 Revision history of test report**

Test report No	Rev.	Issue Date	Changes
80141961-04	0	14 March 2023	Initial test report
80141961-04	1	26 April 2023	5.1 EIRP updated, 5.2 EIRP updated

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 : 20 April 2023

Testing concluded on : 20 April 2023

Checked by:

Tested by:

\_\_\_\_\_  
Klaus Gegenfurtner  
Teamleader Radio

\_\_\_\_\_  
Sabine Kugler  
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 RF output power

The output power of the device is taken from the power measurement in the test report 80141961-05 Rev\_1 issued by CSA Group Bayern GmbH:

EIRP Operating frequency range 1:

Frequency (GHz)	Antenna	Power setting	Level PK (dBm)	Limit PK (dBm)	Margin PK (dB)
61.01	0	P0	25.4	43.0	-17.6
61.235	0	P0	24.2	43.0	-18.8
61.46	0	P0	25.3	43.0	-17.7
61.01	1	P0	25.1	43.0	-17.9
61.235	1	P0	24.8	43.0	-18.2
61.46	1	P0	26.6	43.0	-16.4
61.01	2	P0	24.3	43.0	-18.7
61.235	2	P0	23.9	43.0	-19.1
61.46	2	P0	25.5	43.0	-17.5

EIRP Operating frequency range 2:

Frequency (GHz)	Antenna	Power setting	Level PK (dBm)	Limit PK (dBm)	Margin PK (dB)
60.01	0	P17	6.4	13.0	-6.6
61.965	0	P17	9.8	13.0	-3.2
63.921	0	P17	6.6	13.0	-6.4
60.01	1	P19	5.9	13.0	-7.1
61.965	1	P19	9.1	13.0	-3.9
63.921	1	P19	5.2	13.0	-7.8
60.01	2	P17	6.2	13.0	-6.8
61.965	2	P17	9.2	13.0	-3.8
63.921	2	P17	6.1	13.0	-6.9

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

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## 5.2 Maximum permissible exposure (MPE)

For test instruments and accessories used see section 6 Part **CPC 3**.

### 5.2.1 Description of the test location

Test location: NONE

### 5.2.2 Applicable standard

According to FCC Part 15, Section 15.255(g):

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 methods used comply with ANSI/IEEE C95.1, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".

This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

### 5.2.3 Description of Determination

The maximum rated output power conducted included the tune up tolerance is used to calculate the EIRP. Through the Friis transmission formula, the known maximum gain of the antenna and the maximum power, can be calculated the MPE in a defined distance away from the product.

Friis transmission formula: 
$$P_d = \frac{P_{out} * G}{4 * \Pi * r^2}$$

Where:

$P_d$  = power density (mW/cm<sup>2</sup>)

$P_{out}$  = output power to antenna (mW)

$G$  = gain of antenna (linear scale)

$r$  = distance between antenna and observation point (cm)

According to FCC Rules 47CFR 2.1093(b) the EUT is not a portable device. The EUT is designed to be used that radiating structures are 20 cm outside of the body of the user. ( $r = 20$  cm)

**5.2.4 Determination of MPE according FCC**

Operating frequency range 1:

Frequency	EIRP	Tune-Up	max EIRP	r	S	Limit $S_{eq}$	Margin	Exposure ratio
(GHz)	(dBm)	(dBi)	(mW)	(cm)	(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )	(%)
61.01	25.4	3.0	691.8	20.0	0.138	1.0	-0.862	13.8
61.235	24.8	3.0	602.6	20.0	0.120	1.0	-0.880	12.0
61.46	26.6	3.0	912.0	20.0	0.181	1.0	-0.819	18.1

Operating frequency range 2:

Frequency	EIRP	Tune-Up	max EIRP	r	S	Limit $S_{eq}$	Margin	Exposure ratio
(GHz)	(dBm)	(dBi)	(mW)	(cm)	(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )	(%)
60.01	6.4	3.0	8.7	20.0	0.002	1.0	-0.998	0.2
61.965	9.8	3.0	19.1	20.0	0.004	1.0	-0.996	0.4
63.921	6.6	3.0	9.1	20.0	0.002	1.0	-0.998	0.2

Limits for maximum permissible exposure (MPE):

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(B) Limits for General Population / Uncontrolled Exposure</b>				
0.3 – 1.34	614	1.63	100	30
1.34 – 30	824/ <i>f</i>	2.19/ <i>f</i>	180/ <i>f</i> <sup>2</sup>	30
30 - 300	27.5	0.073	0.2	30
300-1500	---	---	<i>f</i> /1500	30
<b>1500-100000</b>	---	---	<b>1.0</b>	<b>30</b>

*f* = Frequency in MHz

**5.2.5 Determination of MPE according ISED:**

Operating frequency range 1:

Frequency	EIRP	Tune-up	max EIRP	Limit $S_{eq}$	Margin	Exposure ratio
(MHz)	(dBm)	(dBi)	(mW)	(W)	(W)	(%)
61010	25.4	3.0	691.8	5.0	-4.308	13.8
61235	24.8	3.0	602.6	5.0	-4.397	12.1
61460	26.6	3.0	912.0	5.0	-4.088	18.2

Operating frequency range 2:

Frequency	EIRP	Tune-up	max EIRP	Limit $S_{eq}$	Margin	Exposure ratio
(MHz)	(dBm)	(dBi)	(mW)	(W)	(W)	(%)
60010	6.4	3.0	8.7	5.0	-4.991	0.2
61965	9.8	3.0	19.1	5.0	-4.981	0.4
63921	6.6	3.0	9.1	5.0	-4.991	0.2

Exemption limits for routine Evaluation – RF exposure evaluation according RSS102, 2.5.2:

At or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance)

 The requirements are **FULFILLED**.

**Remarks:**     None

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### 5.3 Co-location and Co-transmission

**Applicable standard:**

OET Bulletin 65, Edition 97-01, Section 2: Multiple-transmitter sites and Complex Environments

The FCC's MPE limits vary with frequency. Therefore, in mixed or broadband RF fields where several sources and frequencies are involved, the fraction of the recommended limit (in terms of power density or square of the electric or magnetic field strength) incurred within each frequency interval should be determined, and the sum of all fractional contributions should not exceed 1.0, or 100 % in terms of percentage.

**Remarks:** Not applicable, the TX antennas can be used alternating but can not transmit at the same time.

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### 5.4 SAR test exclusion considerations

#### 5.4.1 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.

**Remarks:** Not applicable, EUT is not portable.

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### 5.5 Exemption limits for routine evaluation - SAR evaluation

#### 5.5.1 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.

**Remarks:** Not applicable, EUT is not portable.

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## 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.
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- End of test report -