



RF - TEST REPORT

- Human Exposure -

Type / Model Name : KY-LOC 1D.02.01

Product Description : Radar sensor

Applicant : Kymati GmbH

Address : Am Hochacker 5

85630 GRASBRUNN, GERMANY

Manufacturer : Kymati GmbH

Address : Am Hochacker 5

85630 GRASBRUNN, GERMANY

<p>Test Result according to the standards listed in clause 1 test standards:</p>	<p>POSITIVE</p>
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<p>Test Report No. : T46910-00-05HS</p>	<p>17. May 2021 Date of issue</p>
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Deutsche
Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

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ATTACHMENT A as separate supplement

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.

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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, October 23, 2015.
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

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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 his/her instructions.

2.3 Photo documentation of the EUT – See ATTACHMENT A

2.4 Equipment type, category

The EUT is a distance measurement system, fixed equipment.

2.5 Short description of the equipment under test (EUT)

Number of tested samples: 1
Serial number: 00002005
Firmware version: 1.0

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

2.6 Variants of the EUT

There are no variants of the EUT.

2.7 Operation frequency

The operating frequency is 61.0 GHz to 61.5 GHz.

2.8 Transmit operating modes

Two operation modes are available:

Primary radar mode	0.5 GHz OBW, FMCW
Secondary radar mode	0.5 GHz OBW, FMCW and FSK(The communication link between device 1 and device 2 uses the FSK)

2.9 Antennas

The following antennas shall be used with the EUT:

- Antenna 0 Integrated linear polarised micro strip patch antenna, 7.0 dBi.
- Antenna 1 Integrated linear polarised micro strip patch antenna, 7.0 dBi.
- Antenna 2 Integrated linear polarised micro strip patch antenna, 7.0 dBi.

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2.10 Power supply system utilised

Power supply voltage : 120 VAC, 60 Hz
Alternative power supply PoE : 55 VDC

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3 TEST RESULT SUMMARY

Operating in the 57 GHz – 71 GHz band:

FCC Rule Part	Description	Result
KDB 447498, 7.1	MPE	passed
KDB 447498, 4.3.1	SAR exclusion consideration	not applicable
KDB 447498, 7.2	Co-location, Co-transmission	not applicable

3.1 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 : 16 December 2020

Testing concluded on : 16 December 2020

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Hermann Smetana
Radio Team

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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

4.1 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 acc. to CISPR 16-4-2 / 2011 + A1 / 2014 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. 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.

4.2 Conformity Decision Rule

The conformity decision rule is based on the ILAC G8 published at the time of reporting.

5 HUMAN EXPOSURE

5.1 RF output power

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

5.1.1 Description of the test location

Test location: NONE

5.1.2 Test result

The output power of the device is taken from the power measurement in the test report T46910-00-03HS according FCC Part 15 C, 15.255 by CSA Group Bayern GmbH.

Primary- and secondary radar mode:

Frequency	Antenna	Level EIRP PK	Antenna gain	Array gain	Conducted level PK	Conduct ed level PK	Limit	Margin
(MHz)		(dBm)	(dBi)	(dBi)	(dBm)	(mW)	(mW)	(mW)
61.05	0	19.8	7	-	12.8	19.2	500	-480.8
61.25	0	21.0	7	-	14.0	24.8	500	-475.2
61.45	0	20.3	7	-	13.3	21.5	500	-478.5
61.05	1	20.1	7	-	13.1	20.3	500	-479.7
61.25	1	20.9	7	-	13.9	24.6	500	-475.4
61.45	1	21.0	7	-	14.0	25.3	500	-474.7
61.05	2	20.6	7	-	13.6	23.1	500	-476.9
61.25	2	21.6	7	-	14.6	29.0	500	-471.0
61.45	2	21.0	7	-	14.0	25.2	500	-474.8
61.05	0+1	22.1	7	3	12.1	16.2	500	-483.8
61.25	0+1	23.1	7	3	13.1	20.5	500	-479.5
61.45	0+1	21.9	7	3	11.9	15.4	500	-484.6
61.05	0+2	23.6	7	3	13.6	22.9	500	-477.1
61.25	0+2	25.3	7	3	15.3	33.8	500	-466.2
61.45	0+2	25.1	7	3	15.1	32.5	500	-467.5

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 15.247(i):

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/cm²)

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)

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5.2.4 Determination of MPE according FCC

Maximum exposure by using 1 antenna:

Rated output power:	14.6 dBm	29.0 mW
Tune-up tolerance:	3.00 dB	
Maximum output power:	17.6 dBm	57.9 mW
Antenna gain max:	7.00 dBi	
Maximum EIRP:	24.6 dBm	290.0 mW
Minimum distance r:	20.0 cm	

Antenna 0

Frequency (GHz)	Antgain (dBi)	EIRP (dBm)	EIRP (mW)	G linear	EIRP (W)	S (mW/cm ²)	Limit S _{eq} (mW/cm ²)	Margin (mW/cm ²)	Exposure ratio (%)
61.05	7.0	22.8	190.55	5.01	0.1905	0.0379	1.0	-0.9621	3.79
61.25	7.0	24.0	251.19	5.01	0.2512	0.0500	1.0	-0.9500	5.00
61.45	7.0	23.3	213.80	5.01	0.2138	0.0425	1.0	-0.9575	4.25

Antenna 1

Frequency (GHz)	Antgain (dBi)	EIRP (dBm)	EIRP (mW)	G linear	EIRP (W)	S (mW/cm ²)	Limit S _{eq} (mW/cm ²)	Margin (mW/cm ²)	Exposure ratio (%)
61.05	7.0	23.1	204.17	5.01	0.2042	0.0406	1.0	-0.9594	4.06
61.25	7.0	23.9	245.47	5.01	0.2455	0.0488	1.0	-0.9512	4.88
61.45	7.0	24.0	251.19	5.01	0.2512	0.0500	1.0	-0.9500	5.00

Antenna 2

Frequency (GHz)	Antgain (dBi)	EIRP (dBm)	EIRP (mW)	G linear	EIRP (W)	S (mW/cm ²)	Limit S _{eq} (mW/cm ²)	Margin (mW/cm ²)	Exposure ratio (%)
61.05	7.0	23.6	229.09	5.01	0.2291	0.0456	1.0	-0.9544	4.56
61.25	7.0	24.6	290.00	5.01	0.2900	0.0577	1.0	-0.9423	5.77
61.45	7.0	24.0	251.19	5.01	0.2512	0.0500	1.0	-0.9500	5.00

Limits for maximum permissible exposure (MPE):

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

f = Frequency in MHz

The requirements are **FULFILLED**.

Remarks:

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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.

- 1. Using Antenna 0: $P_d = 0.05 \text{ mW/cm}^2$
Fraction of MPE: 5.0 %
- 2. Using Antenna 1: $P_d = 0.05 \text{ mW/cm}^2$
Fraction of MPE: 5.0 %
- 3. Using Antenna 2: $P_d = 0.058 \text{ mW/cm}^2$
Fraction of MPE: 5.8 %

Co-transmission is possible only for Antenna 0+1 or Antenna 0+2.

Calculation of the sum of MPE ratios

$$\begin{aligned} \text{Antenna 0} + \text{Antenna 2} &\leq 100 \% ; \\ 5.0 \% + 5.8 \% &= \mathbf{10.8 \%} \leq \mathbf{100 \%} ; \end{aligned}$$

The requirements are **FULFILLED**.

Remarks:

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, the EUT is fixed device.

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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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