

# RF-EXPOSURE ASSESSMENT REPORT

## FCC 47 CFR Part 2.1093

RF-Exposure evaluation of portable equipment

**Report Reference No.** ..... : G0M-1705-6569-TFC093PE-V01

**Testing Laboratory** ..... : Eurofins Product Service GmbH

**Address** ..... : Storkower Str. 38c  
15526 Reichenwalde  
Germany

**Accreditation** ..... :


FCC Test Firm Designation Number: DE0008

**Applicant's name** ..... : dresden elektronik ingenieurtechnik gmbh

**Address** ..... : Enno-Heidebroek-Straße 12  
01237 Dresden  
GERMANY

**Test specification:**
**Standard**..... : 47 CFR 2.1093  
KDB 447498 D01 v06:2015-10-23

**Equipment under test (EUT):**

Product description	DUT2: 2,4GHz IEEE 802.15.4 ZigBee module with u.FL antenna connector	
Model No.	deRFsamR21E-23S20	
Additional Model(s)	deRFsamR21E-23S00 (DUT1: 2,4GHz IEEE 802.15.4 ZigBee module with integrated antenna)	
Brand Name(s)	None	
Hardware version	0	
Firmware / Software version	0	
	FCC-ID: XVV-23SXX	IC: N/A

**Test result** **Passed**

Test Report No.: G0M-1705-6569-TFC093PE-V01

Eurofins Product Service GmbH  
Storkower Str. 38c, D-15526 Reichenwalde, Germany

**Possible test case verdicts:**

- neither assessed nor tested ..... : N/N
- required by standard but not appl. to test object ..... : N/A
- required by standard but not tested ..... : N/T
- not required by standard for the test object ..... : N/R
- test object does meet the requirement ..... : P (Pass)
- test object does not meet the requirement ..... : F (Fail)

**Testing:**

Date of receipt of test item ..... : 2017-06-08

Date of assessment ..... : 2017-09-14



Compiled by ..... : Sebastian Suckow

Assessed by (+ signature) ..... : Sebastian Suckow  
(Responsible for Assessment)

Approved by (+ signature) ..... : Toralf Jahn  
(Head of Lab)

Date of issue ..... : 2017-09-14

Total number of pages ..... : 11

  

**General remarks:**

**The test results presented in this report relate only to the object tested.**

**The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.**

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

**Additional comments:**

---

## Version History

Version	Issue Date	Remarks	Revised by
01	2017-09-14	Initial Release	

## REPORT INDEX

<b>1</b>	<b>EQUIPMENT (TEST ITEM) DESCRIPTION</b>	<b>5</b>
1.1	Reference Documents	6
1.2	Radiation Sources	7
<b>2</b>	<b>RESULT SUMMARY</b>	<b>8</b>
<b>3</b>	<b>RF-EXPOSURE CLASSIFICATIONS</b>	<b>9</b>
<b>4</b>	<b>ASSESSMENT</b>	<b>10</b>
4.1	SAR Exemption Assessment –FCC KDB447498 / RSS-102	10

## 1 Equipment (Test item) Description

<b>Description</b>	DUT2: 2,4GHz IEEE 802.15.4 ZigBee module with u.FL antenna connector
<b>Model</b>	deRFsamR21E-23S20
<b>Additional Model(s)</b>	deRFsamR21E-23S00 (DUT1: 2,4GHz IEEE 802.15.4 ZigBee module with integrated antenna)
<b>Brand Name(s)</b>	None
<b>Serial number</b>	None
<b>Hardware version</b>	0
<b>Software / Firmware version</b>	0
<b>PMN</b>	N/A
<b>HVIN</b>	deRFsamR21E-23S20
<b>FVIN</b>	N/A
<b>HMN</b>	N/A
<b>FCC-ID</b>	XVV-23SXX
<b>IC</b>	N/A
<b>Equipment type</b>	Radio module

## 1.1 Reference Documents

Document type	Document No.	Issued by	Date
FCC 247 Test Report	G0M-1705-6569-TFC247ZB-V02	Eurofins Product Service GmbH	2017-08-11

## 1.2 Radiation Sources

Mode #	Description	
IEEE 802.15.4	Frequency range [MHz]	2400 - 2483.5
	Channels	16
	Modulations	O-QPSK
	Maximum conducted power [dBm]	4.107
	Maximum transmission duty cycle [%]	100

## 2 Result Summary

FCC 47 CFR Part 2.1093, KDB447498			
Product Specific Standard Section	Requirement	Result	Remarks
47 CFR 2.1093 KDB447498	SAR evaluation exemption : IEEE 802.15.4	PASS	
Remarks:			



### 3 RF-Exposure Classifications

Device Types	
Fixed	A fixed device is defined as a device physically secured at one fixed location and cannot be easily re-located.
Mobile	A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. (47 CFR 2.1091)
Portable	A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. (47 CFR 2.1093)

Exposure Categories	
Occupational / Controlled	Limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
General population / uncontrolled	Exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

## 4 Assessment

### 4.1 SAR Exemption Assessment –FCC KDB447498 / RSS-102

Low Power Exclusion acc. to FCC KDB447498 / IC RSS-102		Verdict: PASS
Assessment according to reference	Reference Method	
	KDB447498 & 2.1093 / RSS-102 & Safety Code 6	
Device type	portable	
Exposure category	General population	
FCC/IC SAR Limits		
Region	Occupational SAR values [W/kg]	General public SAR values [W/kg]
Whole-body SAR averaging mass = entire body	0.4	0.08
Partial-body SAR averaging mass = 1g	8.0	1.6
Hands, Wrists, Feet and Ankles SAR averaging mass = 10g	20	4
FCC SAR test exclusion		
<u>Excerpt from KDB 447498:</u>		
<p>Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.</p> <p>The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander</p> <p>The 1-g and 10-g SAR test exclusion thresholds for <b>100 MHz to 6 GHz</b> at <i>test separation distances</i> <b>≤ 50 mm</b> are determined by:</p> $\frac{\text{max. power of channel [mW]}}{\text{min. test separation distance [mm]}} \cdot \sqrt{f[\text{GHz}]} \leq \begin{cases} 3.0 & 1g \text{ SAR} \\ 7.5 & 10g \text{ SAR} \end{cases}$ <ul style="list-style-type: none"><li>▪ f [GHz] is the RF channel transmit frequency in GHz</li><li>▪ Power and distance are rounded to the nearest mW and mm before calculation</li><li>▪ The result is rounded to one decimal place for comparison</li></ul> <p>The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is &lt; 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.</p>		

Assessment results	
Transmission mode	
Operating mode frequency range [MHz]	2402 – 2480
Assessment frequency [MHz]	2405
Transmission duty cycle [%]	100
Peak conducted power [dBm]	4.107
Minimum separation distance [mm]	5.0
Source-based, time averaged conducted power	
Duty cycle correction [dB]	0
Averaged conducted power [dBm]	4.107
Averaged conducted power [mW]	2.575
Source-based, time averaged radiated power	
Antenna gain [dBi]	5.0
Averaged radiated power [dBm e.i.r.p.]	9.107
Averaged radiated power [mW e.i.r.p.]	8.141
SAR evaluation exemption power levels	
FCC SAR test exclusion condition	$\frac{2.6[mW]}{5.0[mm]} \cdot \sqrt{2.405} = 0.81 \leq 3.0 \rightarrow \text{PASS}$
Verdict	
<b>The source-based, time-averaged output power of the EUT fulfills the SAR test exclusion requirements according to FCC KDB447498.</b>	
Comments:	