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SAR TEST REPORT

FCC 47 CFR Part 2.1093
RF-Exposure evaluation of portable equipment

Report Reference No.....:	G0M-1605-5589-TFC093SR-V01
Testing Laboratory.....:	Eurofins Product Service GmbH
Address.....:	Storkower Str. 38c 15526 Reichenwalde Germany
Accreditation.....:	 A2LA Accredited Testing Laboratory, Certificate No.: 1983.01 FCC Filed Test Laboratory, Reg.-No.: 96970
Applicant's name.....:	dresden elektronik ingenieurtechnik gmbh
Address.....:	Enno-Heidebroek-Straße 12 01237 Dresden GERMANY
Test specification:	
Standard.....:	FCC 47 CFR Part 2 §2.1093 447498 D01 General RF Exposure Guidance v06 IEEE Std. 1528 - 2013
Non-standard test method……..:	None
Test scope……..:	complete Radio compliance test
Equipment under test (EUT):	
Product description	2.4 GHz IEEE 802.15.4 compliant radio module
Model No.	deRFmega256-23M12
Additional Model(s)	None
Brand Name(s)	None
Hardware version	REV0
Firmware / Software version	REV1
	FCC-ID: XVV-MEGA23M12 IC: N/A
Test result	**Passed**

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 .....: 2016-05-12

Date (s) of performance of tests .....: 2016-05-17 – 2016-05-18

Compiled by .....: Matthias Handrik

Tested by (+ signature) .....: Matthias Handrik (Responsible for Test)

Approved by (+ signature).....: Christian Weber (Head of Lab)

Date of issue .....: 2016-06-06

Total number of pages .....: 72

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:

Measurements were performed with the EUT integrated into the Host "2.4GHz IEEE 802.15.4 ZigBee USB Gateway"

Version History

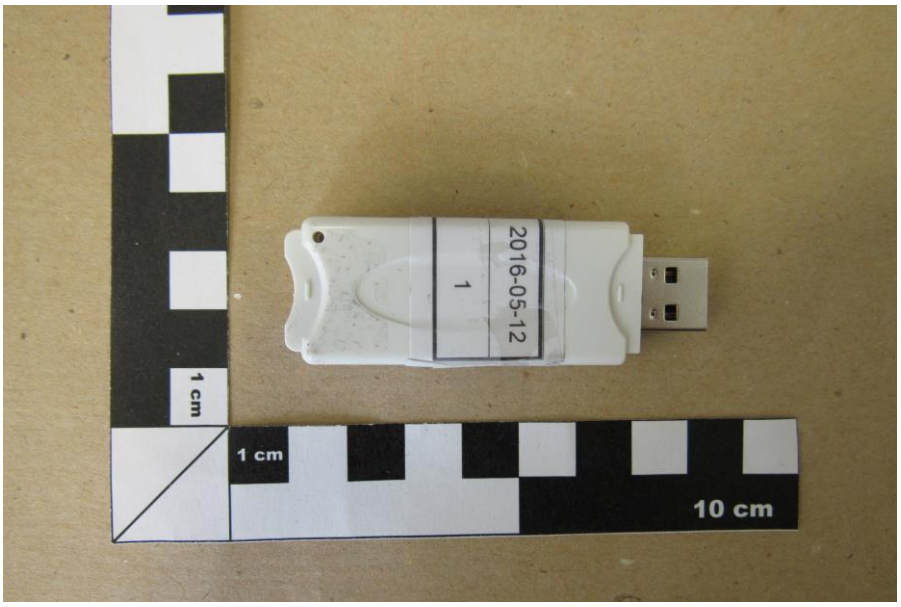
Version	Issue Date	Remarks	Revised by
01	2016-06-06	Initial Release	

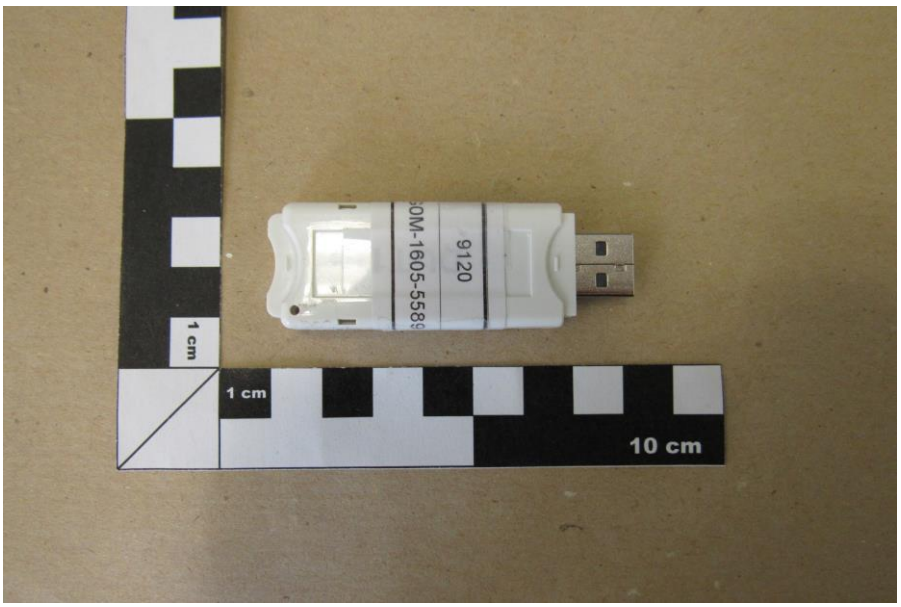
REPORT INDEX

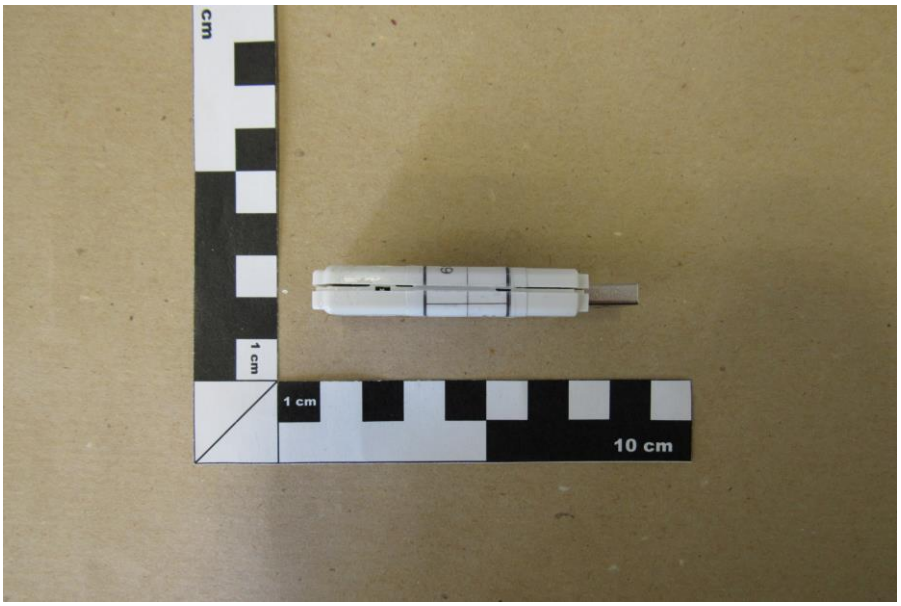
1 Equipment (Test item) Description

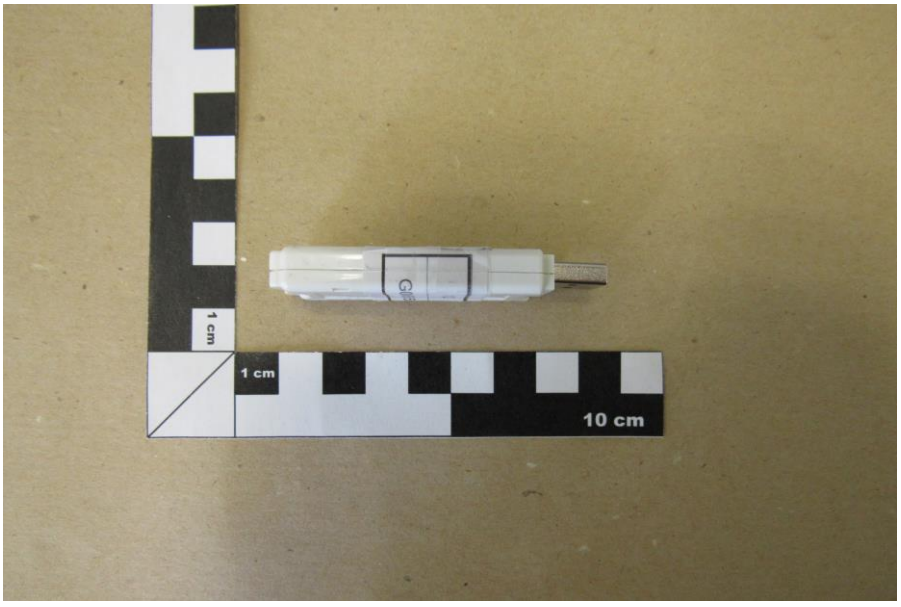
Description	2.4 GHz IEEE 802.15.4 compliant radio module	
Model	deRFmega256-23M12	
Additional Model(s)	None	
Brand Name(s)	None	
Serial number	None	
Hardware version	REV0	
Software / Firmware version	REV1	
FCC-ID	XVV-MEGA23M12	
IC	N/A	
Equipment type	Radio module	
Prototype or production unit	Production Unit	
Environment	General public	
Radio technologies	ZIGBEE IEEE 802.15.4	
Operating frequency ranges	2400 – 2475 MHz	
Host device Information	Type	USB Dongle
	Description	2.4 GHz IEEE 802.15.4 ZigBee USB Gateway
	Model	ConBee
	Hardware version	0
	Software version	1.1
	Contains FCC-ID	XVV-MEGA23M12
Modulations	OQPSK250; OQPSK2000	
Antenna	Type	integrated
	Model	2450AT43B100
	Manufacturer	Johanson Technology
	Gain	+1.3 dBi
Power supply	V_{NOM}	5 V DC (USB)
AC/DC-Adaptor	Model	N/A
	Vendor	N/A
	Input	N/A
	Output	N/A
Accessories	None	
Manufacturer	dresden elektronik ingenieurtechnik gmbh Enno-Heidebroek-Straße 12 01237 Dresden Germany	

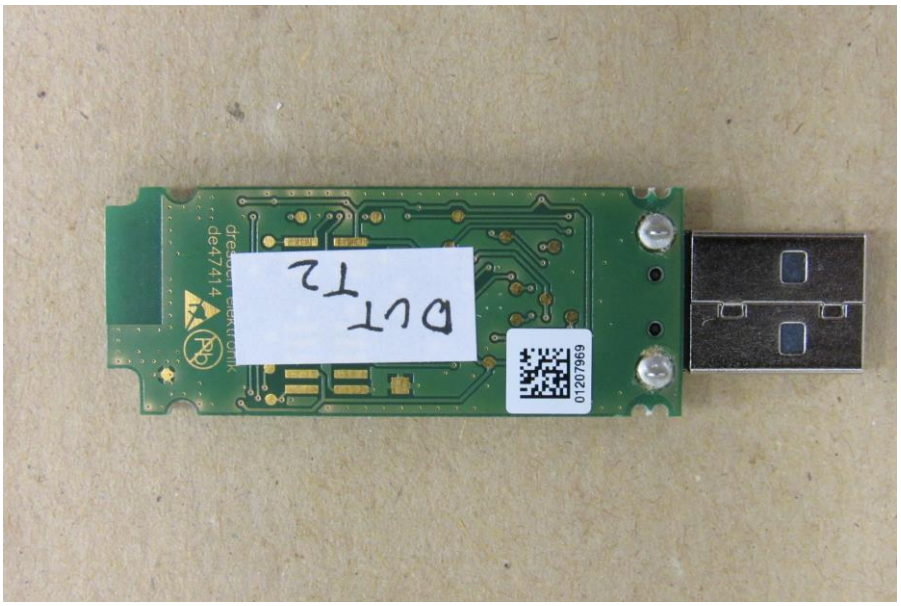
1.1 Equipment photos

EUT FRONT


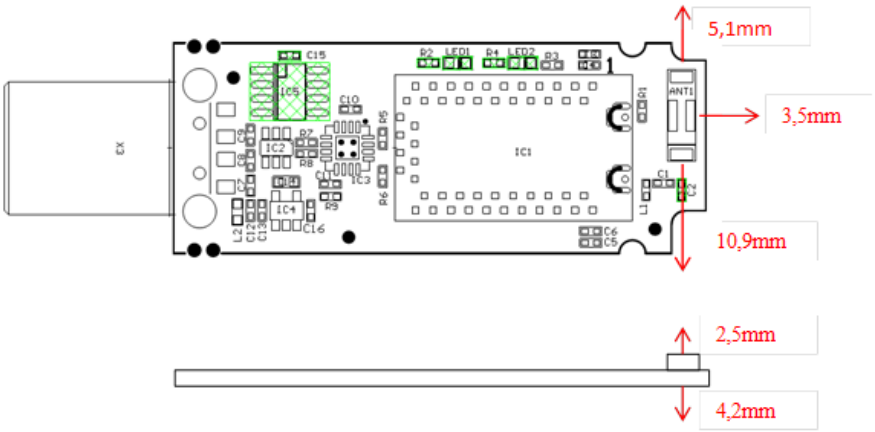
EUT BACK


EUT LEFT


EUT RIGHT


EUT PCB BACK


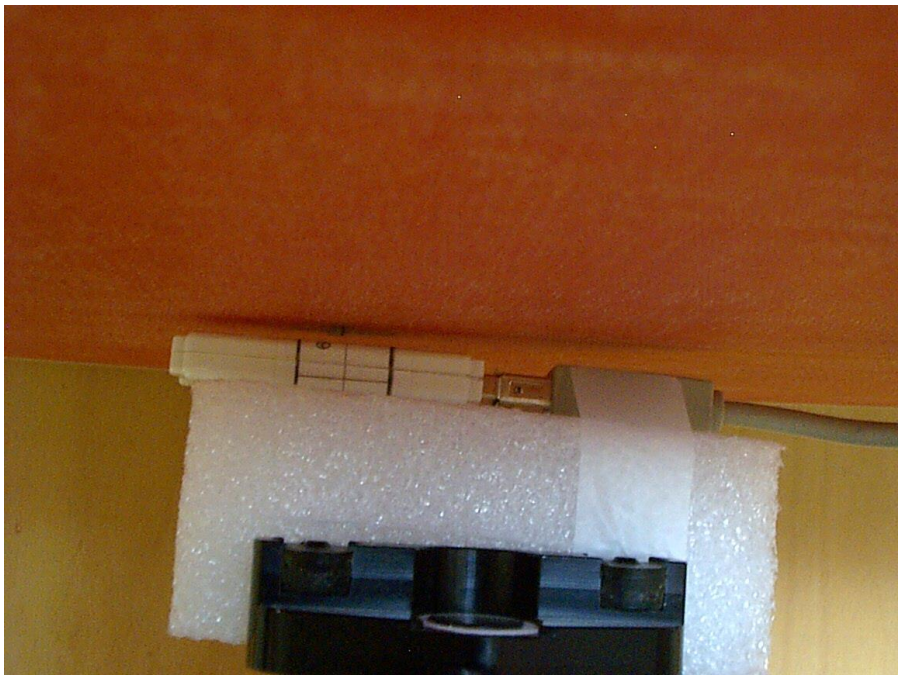
EUT PCB FRONT


Antenna position


1.2 Equipment setup photos

EUT FLAT BACK (5mm from antenna to phantom)


EUT FLAT RIGHT (5mm from antenna to phantom)


EUT FLAT BOTTOM (5mm from antenna to phantom)


EUT FLAT TOP (5mm from antenna to phantom)


1.3 Reference Documents

Document
KDB Publication 447498 : Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Polices
KDB Publication 648474 : SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas
KDB Publication 648474 : Review and Approval Policies for SAR Evaluation of Handsets with Multiple Transmitters and Antennas
KDB Publication 865664 : SAR measurement procedures for devices operating between 100 MHz to 6 GHz
KDB Publication 941225: SAR Measurement Procedures for 3G Devices
KDB Publication 941225: 3GPP R6 HSPA and R7 HSPA+ SAR Guidance
KDB Publication 941225: Recommended SAR Test Reduction Procedures for GSM/GPRS/EDGE
KDB Publication 941225: SAR Test Consideration for LTE Handsets and Data Modems
KDB Publication 447498 : SAR Measurement Procedures for USB Dongle Transmitters
KDB Publication 248227 : SAR Measurement Procedures for 802.11 a/b/g Transmitters
KDB Publication 450824 : SAR Probe Calibration and System Verification considerations for measurements from 150 MHz to 3 GHz

1.4 Supporting Equipment Used During Testing

Product Type*	Device	Manufacturer	Model No.	Comments
AE	Laptop	DELL	Latitude E6420	

***Note:** Use the following abbreviations:

AE : Auxiliary/Associated Equipment, or

SIM : Simulator (Not Subjected to Test)

CABL : Connecting cables

1.5 Supported standalone operating modes

Mode	Modulation	Frequency range	Duty cycle
ZIGBEE (IEEE 802.15.4)	OQPSK250; OQPSK2000	2405 – 2475 MHz	90%

1.6 Conducted Power Values

IEEE 802.15.4 ZigBee – Average Output Power			
Antenna port 1			Including Tune Up tolerance + 1dB
Band	Channel	Frequency [MHz]	Source-base time-average power [dBm]
			Data rate [Mbps]
			2
2.4 GHz	11	2405	13
	18	2440	9.2
	25	2475	4.5
Date, Operator:			17.05.2016 , M. Handrik
Comment: No different in the output power between OQPSK250, OQPSK2000. OQPSK2000 were measured.			

1.7 Standalone Operational Mode Test Exclusion for FCC

According to KDB 447498 D01 v05r02 for standalone SAR evaluation the test exclusion power condition is given by

$$\frac{\max Power, mW}{test\ distance, mm} \cdot \sqrt{f_{GHz}} \leq 3.0$$

for test separation distance ≤ 50mm. For test separation distances > 50mm, the SAR test exclusion threshold is:

$$P_{TH}[mW] = Power\ allowed\ at\ numeric\ threshold\ for\ 50mm + (test\ distance, mm - 50mm) \cdot \frac{f[MHz]}{150}\ ,$$
$$100\ MHz < f < 1500\ MHz$$

$$P_{TH}[mW] = Power\ allowed\ at\ numeric\ threshold\ for\ 50mm + (test\ distance, mm - 50mm) \cdot 10\ ,$$
$$1500\ MHz < f < 6\ GHz$$

SAR Test Exclusion FCC

Mode	P [mW]	Ant.	Reg.	EUT Edge											
				Top		Left		Right		Bottom		Back		Front	
				Antenna distance to user [mm]	SAR Test Exclusion Threshold [mW]	Antenna distance to user [mm]	SAR Test Exclusion Threshold [mW]	Antenna distance to user [mm]	SAR Test Exclusion Threshold [mW]	Antenna distance to user [mm]	SAR Test Exclusion Threshold [mW]	Antenna distance to user [mm]	SAR Test Exclusion Threshold [mW]	Antenna distance to user [mm]	SAR Test Exclusion Threshold [mW]
IEEE 802.15.4; Ch.:11	19.95	ZigBee	FCC	5	**10**	10.9	21	5	**10**	5	**10**	5	**10**		

Comments: All bold Threshold values are above the limit and have to be measured

Date, Operator:	18.05.2016 , M. Handrik

1.8 Supported concurrent (multi-transmitter) operating modes

No multi-transmitter evaluation.