

RF-EXPOSURE ASSESSMENT REPORT

**FCC 47 CFR Part 2.1093
Industry Canada RSS-102**

RF-Exposure evaluation of portable equipment

Report Reference No. : G0M-1303-2693-TFC093P-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
IC OATS Filing assigned code: 3470A

Applicant's name : Panasonic Industrial Devices Europe GmbH

Address : Zeppelinstr. 19
21337 Lüneburg
GERMANY

Test specification:

Standard..... : 47 CFR 1.1310 / 47 CFR 2.1091 / 47 CFR 2.1093
OET Bulletin 65:1997
KDB 447498 v05:2012-10-24
RSS-102, Issue 4:2010
Safety Code 6:2009

Equipment under test (EUT):

| | | |
|-----------------------------|---------------------------|---------------|
| Product description | Bluetooth Module | |
| Model No. | ENW89823C2KF/ENW89823A2KF | |
| Hardware version | 4x | |
| Firmware / Software version | 0x | |
| | FCC-ID: T7V1316 | IC: 216Q-1316 |

Test result : **Passed**

| | | |
|--|-----------------|-----------------|
| Possible test case verdicts: | | |
| - not applicable to test object | N/A | |
| - test object does meet the requirement..... | P (Pass) | |
| - test object does not meet the requirement..... | F (Fail) | |
| Testing: | | |
| Date of receipt of test item | 2013-04-02 | |
| Date (s) of assessment | 2012-04-15 | |
| Compiled by | Christian Weber | |
| Assessed by (+ signature) | Christian Weber | <i>C. Weber</i> |
| (Testing Manager) | | |
| Approved by (+ signature) | Jens Zimmermann | <i>J-Z</i> |
| (Test Lab Manager) | | |
| Date of issue | 2013-04-15 | |
| Total number of pages | 13 | |
| General remarks: | | |
| <p>The test results presented in this report relate only to the object tested.</p> <p>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.</p> <p>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.</p> | | |
| Additional comments: | | |

Version History

| Version | Issue Date | Remarks | Revised by |
|---------|------------|-----------------|------------|
| 01 | 2013-04-15 | Initial Release | |

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1 Equipment (Test item) Description

| | |
|------------------------------------|---------------------------|
| Description | Bluetooth Module |
| Model | ENW89823C2KF/ENW89823A2KF |
| Serial number | None |
| Hardware version | 4x |
| Software / Firmware version | 0x |
| FCC-ID | T7V1316 |
| IC | 216Q-1316 |
| Equipment type | Radio module |

1.1 Reference Documents

| Document type | Document No. | Issued by | Date |
|--------------------------------------|---------------------------|-------------------------------|------------|
| FCC 15.247 Bluetooth Radio Report | G0M-1303-2693-TFC247B-V01 | Eurofins Product Service GmbH | 2013-04-15 |
| FCC 15.247 Bluetooth LE Radio Report | G0M-1303-2693-TFC247W-V01 | Eurofins Product Service GmbH | 2013-04-15 |

1.2 Radiation Sources

| Mode # | Description | |
|--------------|-------------------------------------|--------------------------------|
| Bluetooth | Frequency range [MHz] | 2402 – 2480 |
| | Channels | 79 |
| | Modulations | GFSK / $\pi/4$ -DQPSK / 8-DPSK |
| | Maximum conducted power [dBm] | 10.2 |
| | Maximum transmission duty cycle [%] | 47 |
| Bluetooth LE | Frequency range [MHz] | 2402 – 2480 |
| | Channels | 40 |
| | Modulations | GFSK |
| | Maximum peak power [dBm] | 10.5 |
| | Maximum transmission duty cycle [%] | 100 |

2 Result Summary

| FCC 47 CFR Part 2.1093, KDB447498, IC RSS-102 | | | |
|---|---|--------|---------------------------------|
| Product Specific Standard Section | Requirement | Result | Remarks |
| 47 CFR 2.1093 KDB447498 | SAR evaluation exemption : Bluetooth | PASS | minimum separation distance 6mm |
| 47 CFR 2.1093 KDB447498 | SAR evaluation exemption : Bluetooth LE | PASS | minimum separation distance 6mm |
| RSS-102 2.5.1 | SAR evaluation exemption : Bluetooth | PASS | |
| RSS-102 2.5.1 | SAR evaluation exemption : Bluetooth LE | 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

| MPE Assessment 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 | | |
| <p>Excerpt from KDB 447498:</p> <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 100 MHz to 6 GHz at <i>test separation distances ≤ 50 mm</i> 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"> ▪ f [GHz] is the RF channel transmit frequency in GHz ▪ Power and distance are rounded to the nearest mW and mm before calculation ▪ The result is rounded to one decimal place for comparison <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 < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.</p> | | |

IC SAR evaluation exemptions

Excerpt from RSS-102 Issue 4:

SAR evaluation is required if the separation distance between the user and the radiating element of the device is **less than or equal to 20 cm**, **except** when the device operates as follows:

from **3 kHz up to 1 GHz** inclusively, and with **output power** (i.e. the higher of the conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power) that is **less than or equal to 200 mW for general public use** and **1000 mW for controlled use**;

above 1 GHz and up to 2.2 GHz inclusively, and with **output power** (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is **less than or equal to 100 mW for general public use** and **500 mW for controlled use**;

above 2.2 GHz and up to 3 GHz inclusively, and with **output power** (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is **less than or equal to 20 mW for general public use** and **100 mW for controlled use**;

above 3 GHz and up to 6 GHz inclusively, and with **output power** (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is **less than or equal to 10 mW for general public use** and **50 mW for controlled use**.

Assessment procedure

For the radiation source included into the device the output power is taken from a corresponding RF test report. If needed the output power is converted to source based, time-averaged output power. Finally the output power is compared to the FCC and IC low power SAR evaluation exemption level.

| Assessment results – Bluetooth | |
|---|---|
| Transmission mode | |
| Operating mode frequency range [MHz] | 2402 – 2480 |
| Assessment frequency [MHz] | 2480 |
| Transmission duty cycle [%] | 47 |
| Peak conducted power [dBm] | 10.2 |
| Minimum separation distance [mm] | 6.0 |
| Source-based, time averaged power | |
| Duty cycle correction [dB] | -3.28 |
| Averaged peak power [dBm] | 6.9 |
| Averaged peak power [mW] | 4.9 |
| Averaged radiated power | |
| Antenna gain [dBi] | 0.9 |
| Averaged radiated power [dBm e.i.r.p.] | 7.8 |
| Averaged radiated power [mW e.i.r.p.] | 6.1 |
| SAR evaluation exemption power levels | |
| FCC SAR test exclusion condition | $\frac{4.9[mW]}{6.0[mm]} \cdot \sqrt{2.480 [GHz]} = 1.3 \leq 3.0 \rightarrow \text{PASS}$ |
| IC SAR test exclusion condition | $6.1 mW(e.i.r.p) \leq 20 mW \rightarrow \text{PASS}$ |
| Verdict | |
| The source-based, time-averaged output power of the EUT fulfills the SAR test exclusion requirements according to FCC KDB447498 and IC RSS-102 | |
| Comments: | |

| Assessment results – Bluetooth LE | |
|---|--|
| Transmission mode | |
| Operating mode frequency range [MHz] | 2402-2480 |
| Assessment frequency [MHz] | 2480 |
| Transmission duty cycle [%] | 100 |
| Peak conducted power [dBm] | 10.52 |
| Minimum separation distance [mm] | 6.0 |
| Source-based, time averaged power | |
| Duty cycle correction [dB] | 0.0 |
| Averaged peak power [dBm] | 10.5 |
| Averaged peak power [mW] | 11.2 |
| Averaged radiated power | |
| Antenna gain [dBi] | 0.9 |
| Averaged radiated power [dBm e.i.r.p.] | 11.4 |
| Averaged radiated power [mW e.i.r.p.] | 13.8 |
| SAR evaluation exemption power levels | |
| FCC SAR test exclusion condition | $\frac{11.2[mW]}{6.0[mm]} \cdot \sqrt{2.480 [GHz]} = 2.9 \leq 3.0 \rightarrow \text{PASS}$ |
| IC SAR test exclusion condition | $13.8 mW(e.i.r.p.) \leq 20 mW \rightarrow \text{PASS}$ |
| Verdict | |
| The source-based, time-averaged output power of the EUT fulfills the SAR evaluation exemption requirements according to FCC KDB447498 and IC RSS-102 | |
| Comments: | |