# EMC TEST REPORT

**FCC 47 CFR Part 15B, ISED ICES-003 Issue 6**

| | |
|---|---|
| **Report Reference No** | G0M-1910-8555-EF0115B-V01 |
| **Testing Laboratory** | Eurofins Product Service GmbH |
| Address | Storkower Str. 38c<br>15526 Reichenwalde<br>Germany |
| Accreditation | DAkkS - Registration number : D-PL-12092-01-03 (ISED)<br>ISED Testing Laboratory site: 3470A-2<br>DAkkS - Registration number : D-PL-12092-01-04 (FCC)<br>FCC Filed Test Laboratory, Reg.-No.: 96970 |
| **Applicant** | dresden elektronik ingenieurtechnik gmbh |
| Address | Enno-Heidebroek-Straße 12<br>01237 Dresden<br>GERMANY |
| **Test Specification**<br>Standard(s) | 47 CFR Part 15 Subpart B<br>ISED ICES-003 Issue 6<br>ANSI C63.4:2014 |
| Non-Standard Test Method | None |
| **Equipment under Test (EUT):** | |
| Product Description | Zigbee Radio Module for Raspberry Pi |
| Model(s) | RaspBee II |
| Additional Model(s) | None |
| Brand Name(s) | None |
| Hardware Version(s) | 5 770 19 00.150.00 |
| Software Version(s) | 0 |
| FCC-ID | XVV-RASPBEE2 |
| IC | 8720A-RASPBEE2 |
| **Test Result** | **PASSED** |

| | | |
|---|---|---|
| **Possible test case verdicts:** | | |
| required by standard but not tested | N/T | |
| not required by standard | N/R | |
| required by standard but not appl. 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 | 2019-11-08 | |
| **Report:** | | |
| Compiled by | Stephan Liebich | |
| Tested by (+ signature)<br>(Responsible for Test) | Stephan Liebich<br><br>Matthias Handrik |  |
| Approved by (+ signature)<br>(Head of Lab) | Christian Weber |  |
| Date of Issue | 2020-02-26 | |
| Total number of pages | 29 | |
| **General Remarks:** | | |
| **The test results presented in this report relate only to the object tested.**<br>**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.**<br>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. | | |
| **Additional Comments:** | | |
| | | |

## ABBREVIATIONS AND ACRONYMS

| Acronyms | |
|---|---|
| Acronym | Description |
| EUT | Equipment Under Test |
| FCC | Federal Communications Commission |
| ISED | Innovation, Science and Economic Development Canada |
| $T_{NOM}$ | Nominal operating temperature |
| $V_{NOM}$ | Nominal supply voltage |

## VERSION HISTORY

| Version History | | | |
|---|---|---|---|
| Version | Issue Date | Remarks | Revised By |
| 01 | 2020-02-26 | Initial Release | |

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# 1 Equipment (Test Item) Under Test

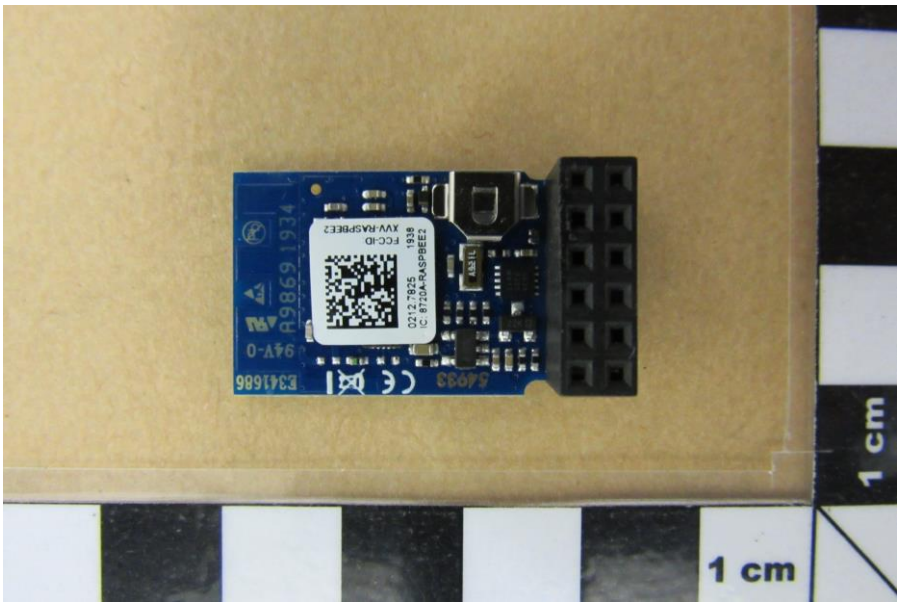
| | | |
|---|---|---|
| Description | Zigbee Radio Module for Raspberry Pi | |
| Model | RaspBee II | |
| Additional Model(s) | None | |
| Brand Name(s) | None | |
| Serial Number(s) | unspecified | |
| Hardware Version(s) | 5 770 19 00.150.00 | |
| Software Version(s) | 0 | |
| FCC-ID | XVV-RASPBEE2 | |
| IC | 8720A-RASPBEE2 | |
| Class | Class B | |
| Equipment type | Table top | |
| Highest internal frequency [MHz] | 2483.5 | |
| Supply Voltage | $V_{NOM}$ | 5 V DC (external power supply) |
| AC/DC-Adaptor | None | |
| Manufacturer | dresden elektronik ingenieurtechnik gmbh<br>Enno-Heidebroek-Straße 12<br>01237 Dresden<br>GERMANY | |

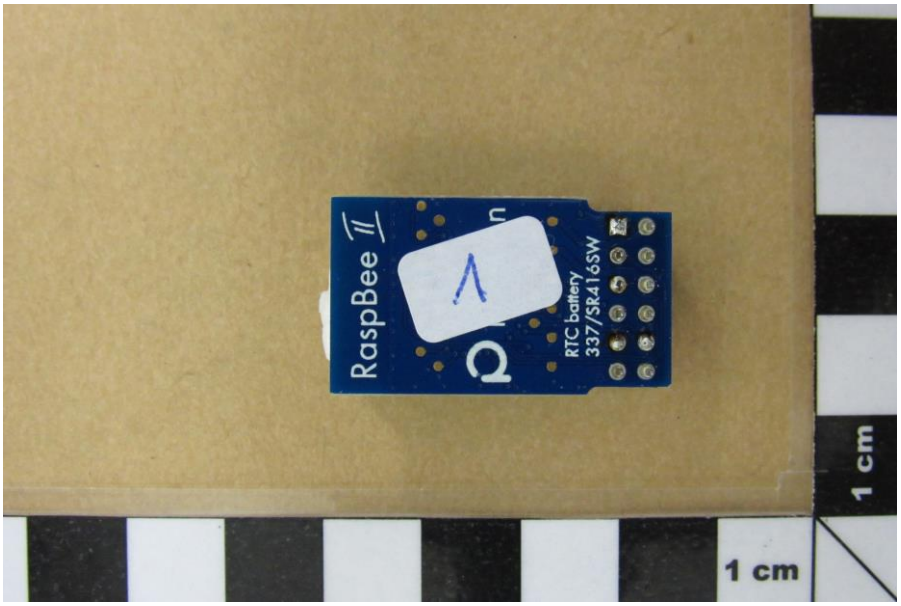
## 1.1 Equipment Ports

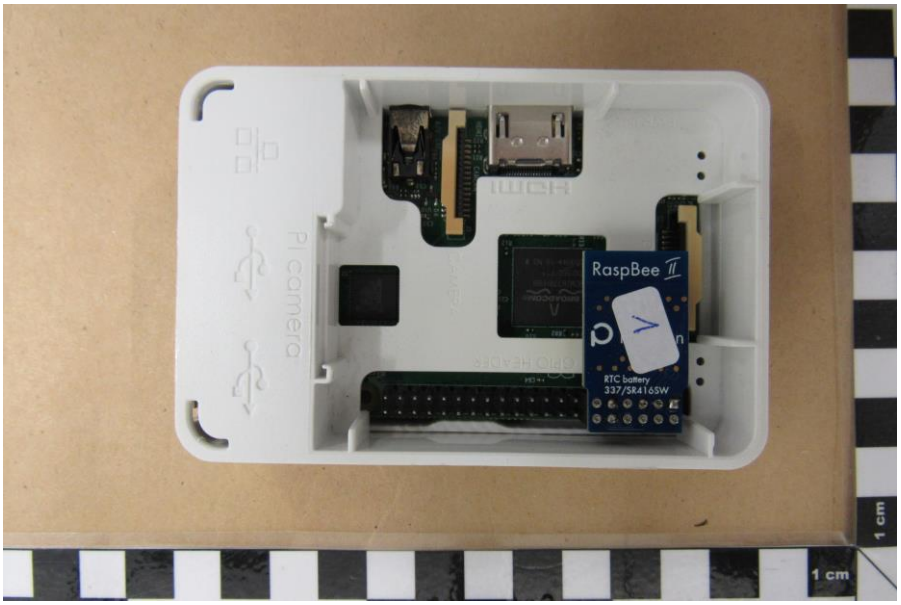
| Name | Type | Attributes | | Comment |
|---|---|---|---|---|
| POWER | DC | Count:<br>Direction:<br>Service only: | 1<br>In<br>No | - |
| UART | IO | Count:<br>Direction:<br>Service only: | 1<br>IO<br>No | - |
| I2C | IO | Count:<br>Direction:<br>Service only: | 1<br>IO<br>No | - |

| Description: | |
|---|---|
| AC | AC mains power input/output port |
| DC | DC power input/output port |
| BAT | DC power input port connected to external battery |
| IO | Input/Output port |
| TP | Telecommunication port |
| NE | Non-electrical port |

## 1.2 Equipment Photos

| EUT TOP SIDE |
| --- |
|  |

| EUT BOTTOM SIDE |
| --- |
|  |

| EUT INSERTED IN EVALUATION BOARD |
| --- |
|  |

## 1.3 Support Equipment

| Product Type | Device | Manufacturer | Model | Comment |
|---|---|---|---|---|
| AE | Raspberry Pi | Raspberry Pi Foundation | Raspberry Pi 3 | Host for EUT |
| AE | Conbee | De | - | Companion device, ZigBee USB dongle |
| MON | Laptop | Lenovo | T450 | - |
| AE | AC/DC-Adaptor 1 | Lenovo | ADLX45NDC3A | - |
| AE | AC/DC-Adaptor 2 | SAMSUNG | ETA-U90EWE | - |
| Description: | | | | |
| AE | Auxiliary Equipment | | | |
| SIM | Simulator | | | |
| MON | Monitoring Equipment | | | |
| CBL | Connecting Cable | | | |
| Comment: | | | | |

## 1.4 Operational Modes

| Mode # | Description |
|---|---|
| 1 | ZigBee Tx<br>(EUT sends/receives permanent data packages to/from companion device via ZigBee connection) |
| Comment: | |

## 1.5 EUT Configuration

| Configuration # | Description |
|---|---|
| 1 | EUT is inserted in Raspberry Pi.<br>EUT get power from Raspberry Pi.<br>Raspberry Pi is powered up and powered with 5 V DC via USB connection from Laptop.<br>Laptop is powered via AC/DC-Adaptor 1 with 120 V / 60 Hz external power supply.<br>Conbee is connected with Laptop<br>EUT sends permanent data packages to Conbee via ZigBee connection.<br><br>Laptop is used for monitoring the sends and receives data packages. |
| 2 | EUT is inserted in Raspberry Pi.<br>EUT get power from Raspberry Pi.<br>Raspberry Pi is powered up and powered with 5 V DC via USB connection from AC/DC-Adaptor 2.<br>AC/DC-Adaptor 2 is powered with 120 V / 60 Hz external power supply.<br>Conbee is connected with Laptop<br>EUT sends permanent data packages to Conbee via ZigBee connection.<br><br>Laptop is used for monitoring the sends and receives data packages. |
| Comment: | |

## 1.6 Sample emission level calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading:

This is the reading obtained on the spectrum analyser in dBµV. Any external preamplifiers used are taken into account through internal analyser settings.

A.F.:

This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyser. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

Reading on Analyser (dBµV) + A.F. (dB/m) = Net field strength (dBµV/m)

Net:

This is the net field strength measurement (as shown above).

Limit:

This is the FCC Class B radiated emission limit (in units of dBµV/m). The FCC limits are given in units of µV/m. The following formula is used to convert the units of µV/m to dBµV/m:

Limit (dBµV/m) = 20*log (µV/m)

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example only:

| | | | | |
|---|---|---|---|---|
| Reading + AF | = Net Reading | : | Net reading - FCC limit | = Margin |
| +21.5 dBµV + 26 dB/m | = 47.5 dBµV/m | : | 47.5 dBµV/m - 57.0 dBµV/m | = -9.5 dB |

## 2 Result Summary

| FCC 47 CFR Part 15B, ISED ICES-003 Issue 6 | | | | |
|---|---|---|---|---|
| **Reference** | **Requirement** | **Reference Method** | **Result** | **Remarks** |
| Emission | | | | |
| FCC 15.109<br>ICES-003, 8, 6.1 | Radiated emissions | ANSI C63.4:2014 | PASS | - |
| FCC 15.107<br>ICES-003, 8, 6.2 | AC power line conducted emissions | ANSI C63.4:2014 | PASS | - |
| Comment: | | | | |

| Possible Test Case Verdicts | |
|---|---|
| PASS | Test object does meet the requirements |
| FAIL | Test object does not meet the requirements |
| N/T | Required by standard but not tested |
| N/R | Not required by standard for the test object |

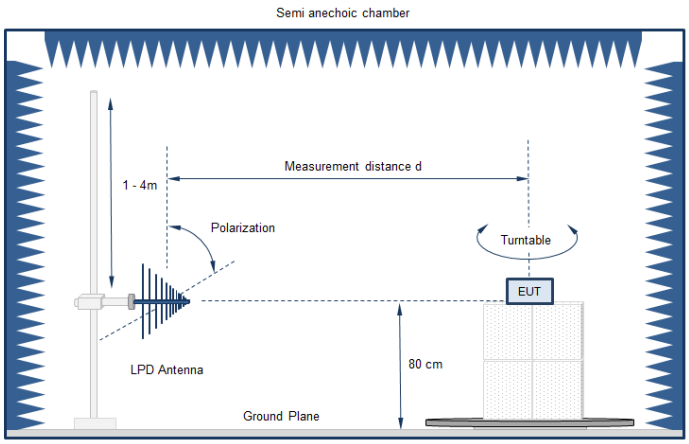
## 2.1 Test Conditions and Results - Radiated emissions acc. to ANSI C63.4

### 2.1.1 Information

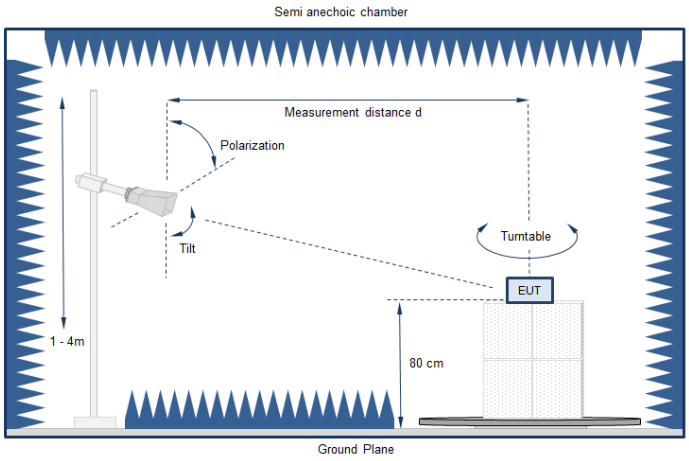
| Test Information | |
|---|---|
| Reference | FCC 15.109, ICES-003, 8, 6.1 |
| Reference method | ANSI C63.4:2014 Section 8 |
| Equipment class | Class B |
| Equipment type | Table top |
| Highest internal frequency [MHz] | 2483.5 |
| Measurement range | 30 MHz to 13000 MHz |
| Temperature [°C] | 24 |
| Humidity [%] | 29 |
| Operator | Stephan Liebich |
| Date | 2019-12-16 |

### 2.1.2 Setup

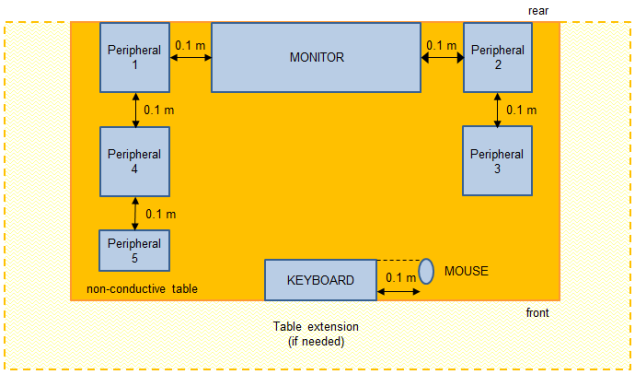
**Measurement up to 1 GHz**



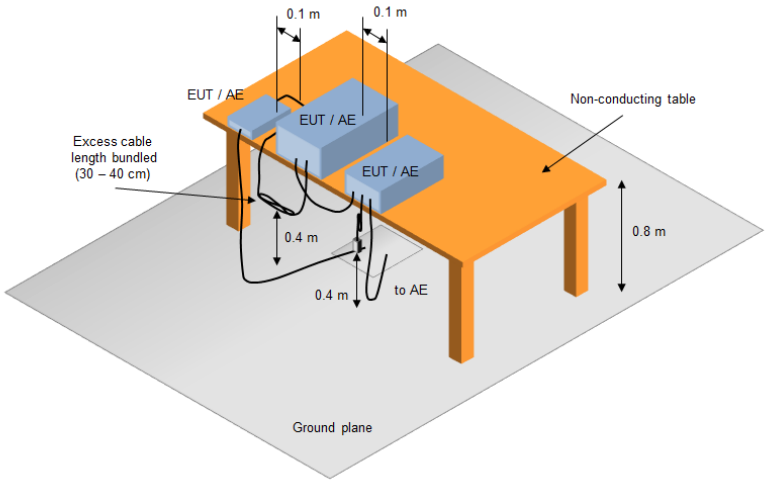

**Measurement above 1 GHz**



**Equipment placement - Table top**




**Test Setup**




2.1.3 Equipment

| Test Software | | | |
|---|---|---|---|
| Description | Manufacturer | Name | Version |
| EMC Software | DARE Instruments | Radimation | 2016.1.10 |

| Test Equipment | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Identifier | Cal. Date | Cal. Due |
| Anechoic chamber | Frankonia | AC1 | EF00062 | 2018-07 | 2021-07 |
| EMI Test Receiver | Keysight | N9038A-526/WXP | EF01070 | 2019-09 | 2020-09 |
| Biconical Antenna | R&S | HK 116 | EF00030 | 2019-04 | 2022-04 |
| LPD Antenna | R&S | HL 223 | EF00187 | 2019-05 | 2022-05 |
| Horn antenna | Schwarzbeck | BBHA 9120D (1-18GHz) | EF00018 | 2017-09 | 2020-09 |
| Climatic Sensor | Embedded Data Systems, LLC. | 2800100000254 17E | EF01054 | 2019-05 | 2020-05 |

2.1.4 Procedure

| Exploratory measurement |
|---|
| 1. The EUT was placed on a non-conductive table at a height of 0.8m.<br>2. The EUT and support equipment, if needed, were set up to simulate typical usage.<br>3. Cables, of type and length specified by the manufacturer, were connected to at least one port of each type and were terminated by a device or simulating load of actual usage.<br>4. The antenna was placed at a distance of 3 or 10 m.<br>5. The received signal was monitored at the measurement receiver.<br>6. This procedure has to be performed in both antenna polarizations, horizontal and vertical.<br>7. The arrangement of the equipment with the maximum emission level is shown on the setup picture at item 1.3 |

| Final measurement |
|---|
| 1. The EUT was placed on a 0.8 m non-conductive table at a 3 m distance from the receive antenna. The antenna output was connected to the measurement receiver.<br>2. A biconical antenna was used for the frequency range 30 – 200 MHz, a logarithmic periodical antenna was used for the frequency range from 200 – 1000 MHz. Above one 1 GHz a Double Ridged Broadband Horn antenna was used. The antenna was placed on an adjustable height antenna mast.<br>3. The EUT and cable arrangement were based on the exploratory measurement results.<br>4. Emissions were maximized at each frequency by rotating the EUT and adjusting the receive antenna height and polarization. The maximum values were recorded.<br>5. The test data of the worst-case conditions were recorded and shown on the next pages. |

2.1.5 Limits

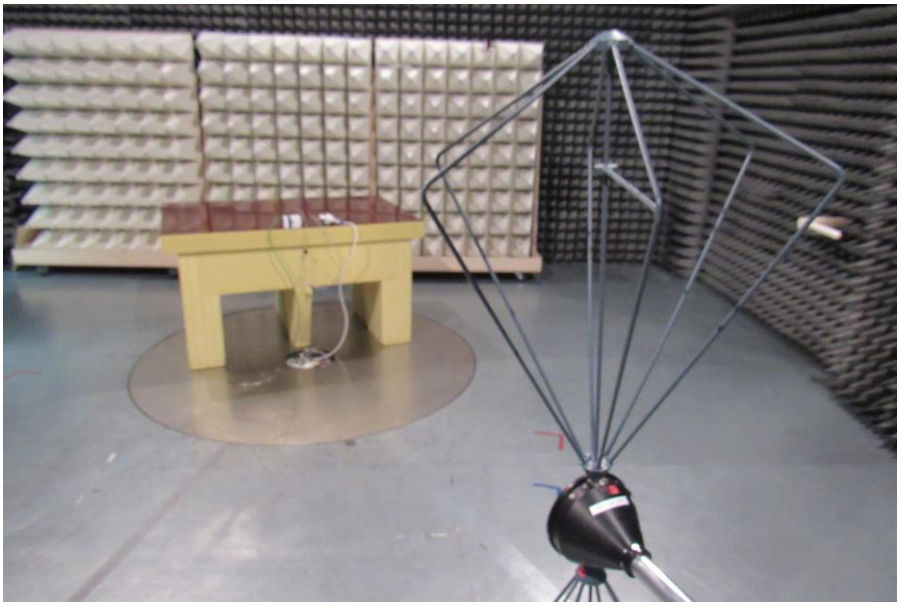
| Class B @ 3 m | | |
|---|---|---|
| Frequency [MHz] | Detector | Limit [dBµV/m] |
| 30 - 88 | Quasi-peak | 40 |
| 88 - 216 | Quasi-peak | 43.5 |
| 216 - 960 | Quasi-peak | 46 |
| 960 - 1000 | Quasi-peak | 54 |
| > 1000 | Peak<br>Average | 74<br>54 |

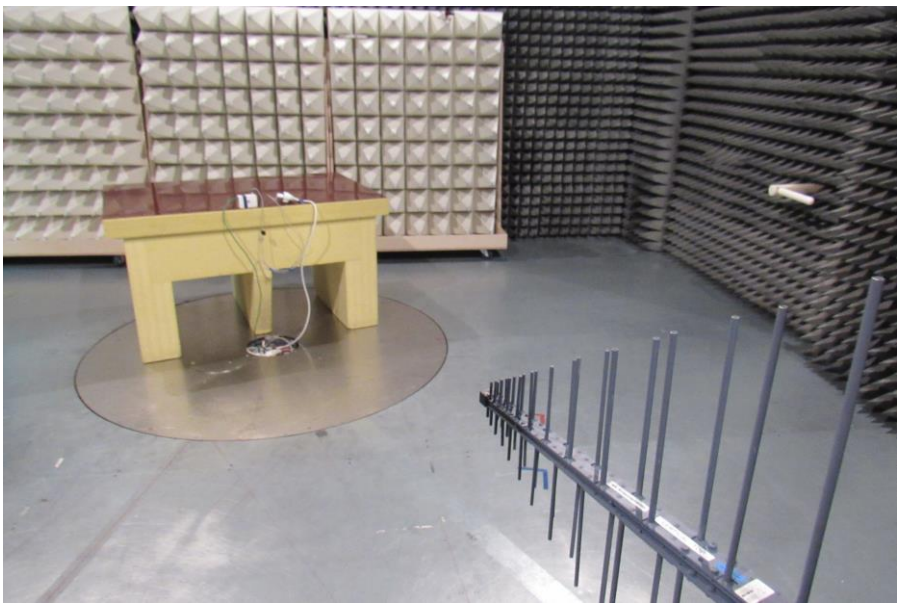
| Class A @ 10 m | | |
|---|---|---|
| Frequency [MHz] | Detector | Limit [dBµV/m] |
| 30 - 88 | Quasi-peak | 39 |
| 88 - 216 | Quasi-peak | 43.5 |
| 216 - 960 | Quasi-peak | 46.5 |
| 960 - 1000 | Quasi-peak | 49.5 |
| > 1000 | Peak<br>Average | 69.5<br>49.5 |

2.1.6 Results

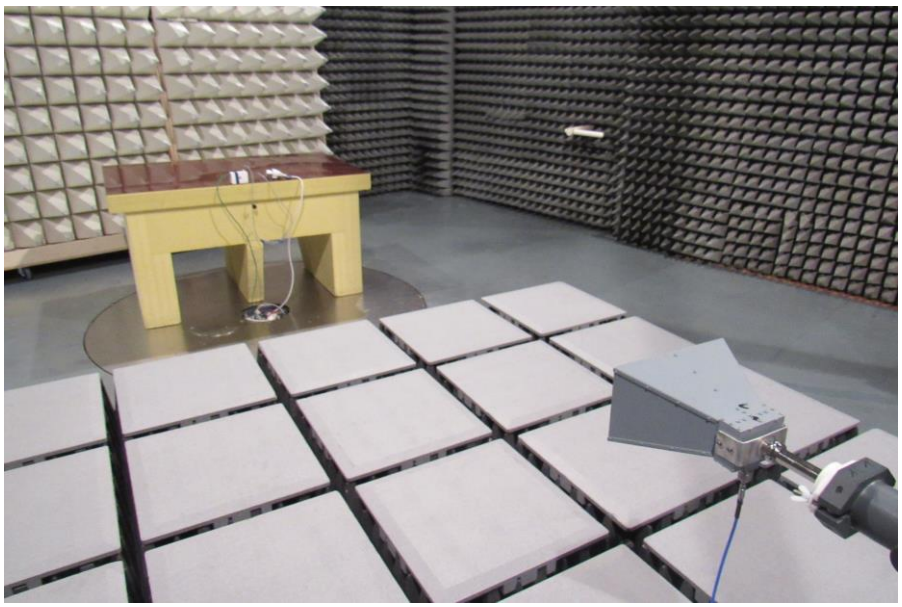
| Test Results | | | |
|---|---|---|---|
| Operational mode | EUT Configuration | Verdict | Remark |
| 1 | 2 | PASS | - |

2.1.7 Setup Photos

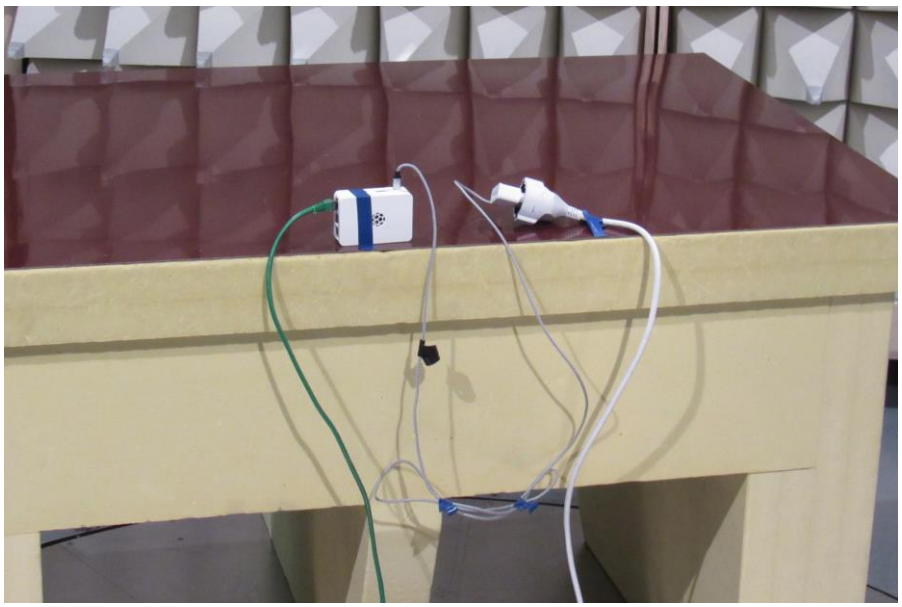
| TEST SETUP 1 RADIATED EMISSION |
| --- |
|  |

| TEST SETUP 2 RADIATED EMISSION |
| --- |
|  |

**TEST SETUP 3 RADIATED EMISSION**



**TEST SETUP FOCUS RADIATED EMISSION**



2.1.8 Records

## Radiated emissions according to FCC part 15B

| | |
|---|---|
| Project Number: | G0M-1910-8555 |
| Applicant: | dresden elektronik ingenieurtechnik gmbh |
| Model Description: | Zigbee Radio Module for Raspberry Pi |
| Model: | RaspBee II |
| Test Sample ID: | 1 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Mr. Liebich |
| Test Date: | 2019-12-16 |
| Operating Conditions: | ambient temperature: 24 °C<br>power input: 120 V / 60 Hz |
| Antenna: | Rohde & Schwarz HK 116, Horizontal |
| Measurement Distance: | 3m |
| Mode: | 1 |
| Note 1: | |

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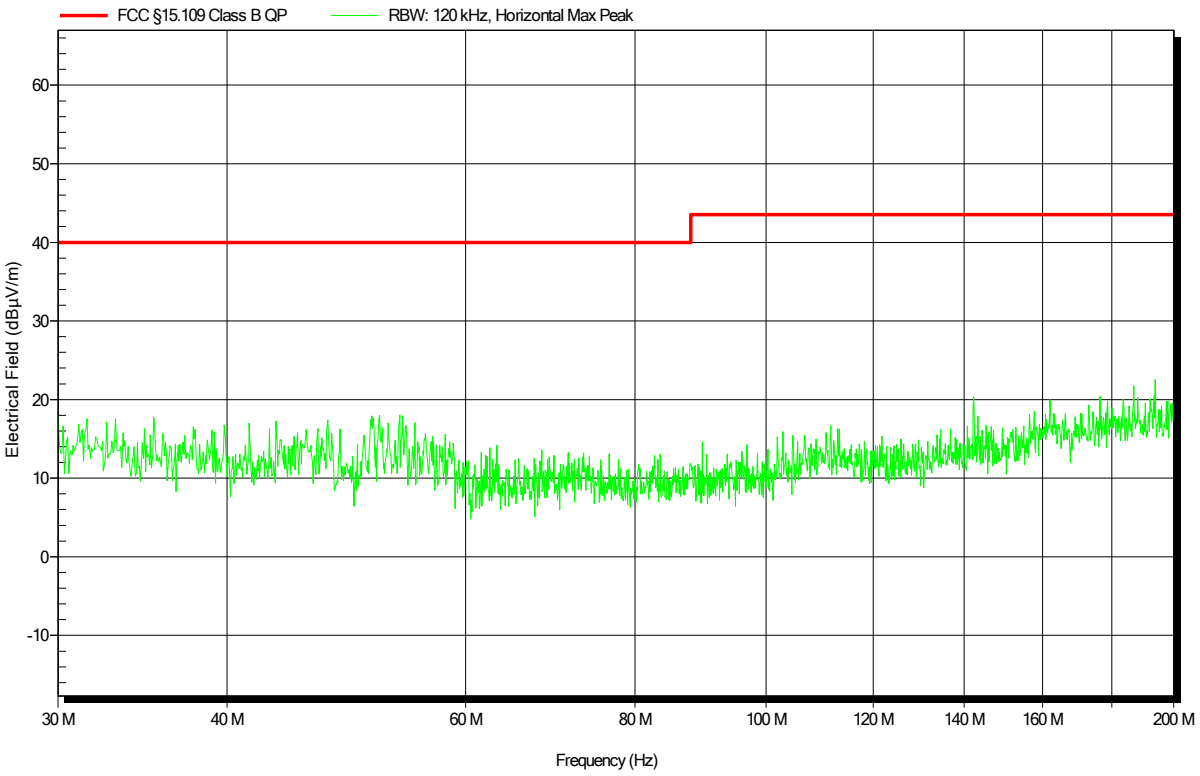

## Radiated emissions according to FCC part 15B

| | |
|---|---|
| Project Number: | G0M-1910-8555 |
| Applicant: | dresden elektronik ingenieurtechnik gmbh |
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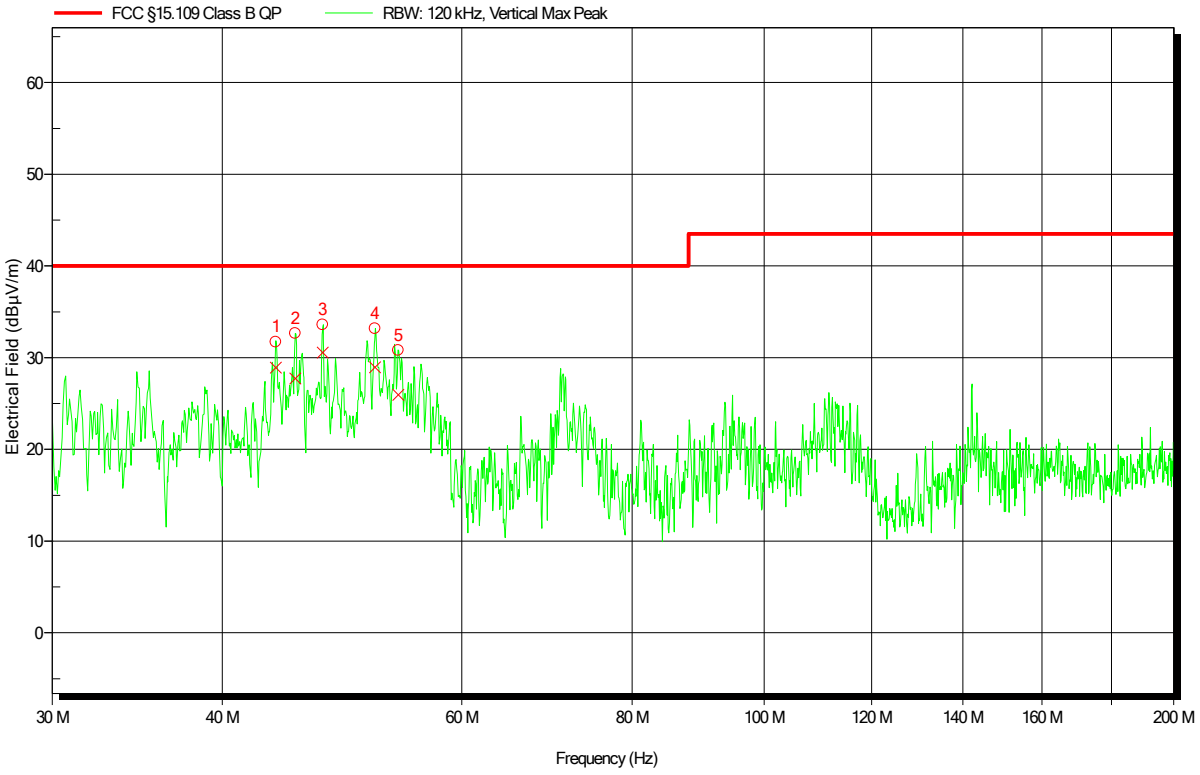
| Model: | RaspBee II |
| Test Sample ID: | 1 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Mr. Liebich |
| Test Date: | 2019-12-16 |
| Operating Conditions: | ambient temperature: 24 °C<br>power input: 120 V / 60 Hz |
| Antenna: | Rohde & Schwarz HK 116, Vertical |
| Measurement Distance: | 3m |
| Mode: | 1 |

Index 2




| Peak Number | Frequency | Quasi-Peak | Quasi-Peak Limit | Quasi-Peak Difference | Quasi-Peak Status | Angle | Height |
|---|---|---|---|---|---|---|---|
| 1 | 43.793 MHz | 28.92 dBµV/m | 40 dBµV/m | -11.08 dB | Pass | 0 Degree | 1 m |
| 2 | 45.259 MHz | 27.72 dBµV/m | 40 dBµV/m | -12.28 dB | Pass | 0 Degree | 1 m |
| 3 | 47.414 MHz | 30.54 dBµV/m | 40 dBµV/m | -9.46 dB | Pass | 0 Degree | 1 m |
| 4 | 51.81 MHz | 28.95 dBµV/m | 40 dBµV/m | -11.05 dB | Pass | 0 Degree | 1 m |
| 5 | 53.87 MHz | 25.95 dBµV/m | 40 dBµV/m | -14.05 dB | Pass | 0 Degree | 1 m |

## Radiated emissions according to FCC part 15B

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|---|---|
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| Applicant: | dresden elektronik ingenieurtechnik gmbh |
| Model Description: | Zigbee Radio Module for Raspberry Pi |
| Model: | RaspBee II |
| Test Sample ID: | 1 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Mr. Liebich |
| Test Date: | 2019-12-16 |
| Operating Conditions: | ambient temperature: 24 °C<br>power input: 120 V / 60 Hz |
| Antenna: | Rohde & Schwarz HL 223, Horizontal |
| Measurement Distance: | 3m |
| Mode: | 1 |

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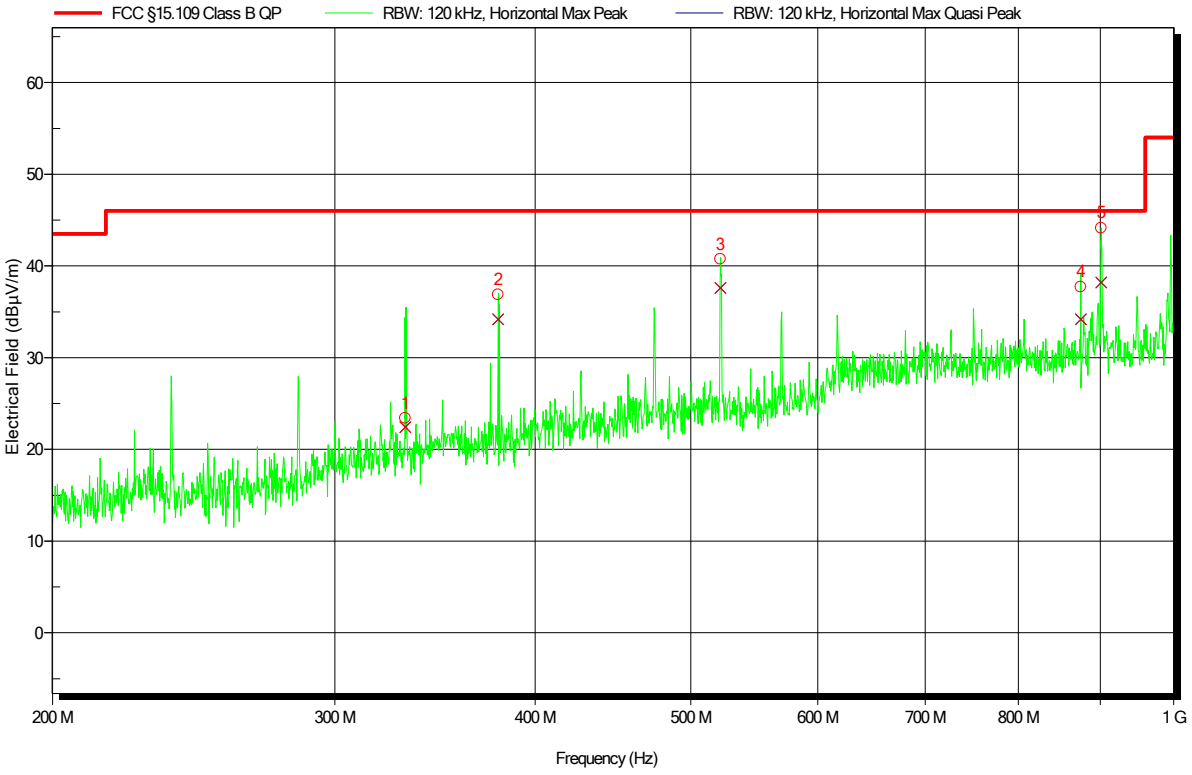


| Peak Number | Frequency | Quasi-Peak | Quasi-Peak Limit | Quasi-Peak Difference | Quasi-Peak Status | Angle | Height |
|---|---|---|---|---|---|---|---|
| 1 | 331.978 MHz | 22.41 dBµV/m | 46.02 dBµV/m | -23.61 dB | Pass | 0 Degree | 1 m |
| 2 | 379.37 MHz | 34.19 dBµV/m | 46.02 dBµV/m | -11.84 dB | Pass | 0 Degree | 1 m |
| 3 | 521.765 MHz | 37.61 dBµV/m | 46.02 dBµV/m | -8.41 dB | Pass | 0 Degree | 1 m |
| 4 | 874.993 MHz | 34.18 dBµV/m | 46.02 dBµV/m | -11.84 dB | Pass | 0 Degree | 1 m |
| 5 | 901.045 MHz | 38.2 dBµV/m | 46.02 dBµV/m | -7.83 dB | Pass | 0 Degree | 1 m |

## Radiated emissions according to FCC part 15B

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| Model Description: | Zigbee Radio Module for Raspberry Pi |
| Model: | RaspBee II |
| Test Sample ID: | 1 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Mr. Liebich |
| Test Date: | 2019-12-16 |
| Operating Conditions: | ambient temperature: 24 °C<br>power input: 120 V / 60 Hz |
| Antenna: | Rohde & Schwarz HL 223, Vertical |
| Measurement Distance: | 3m |
| Mode: | 1 |

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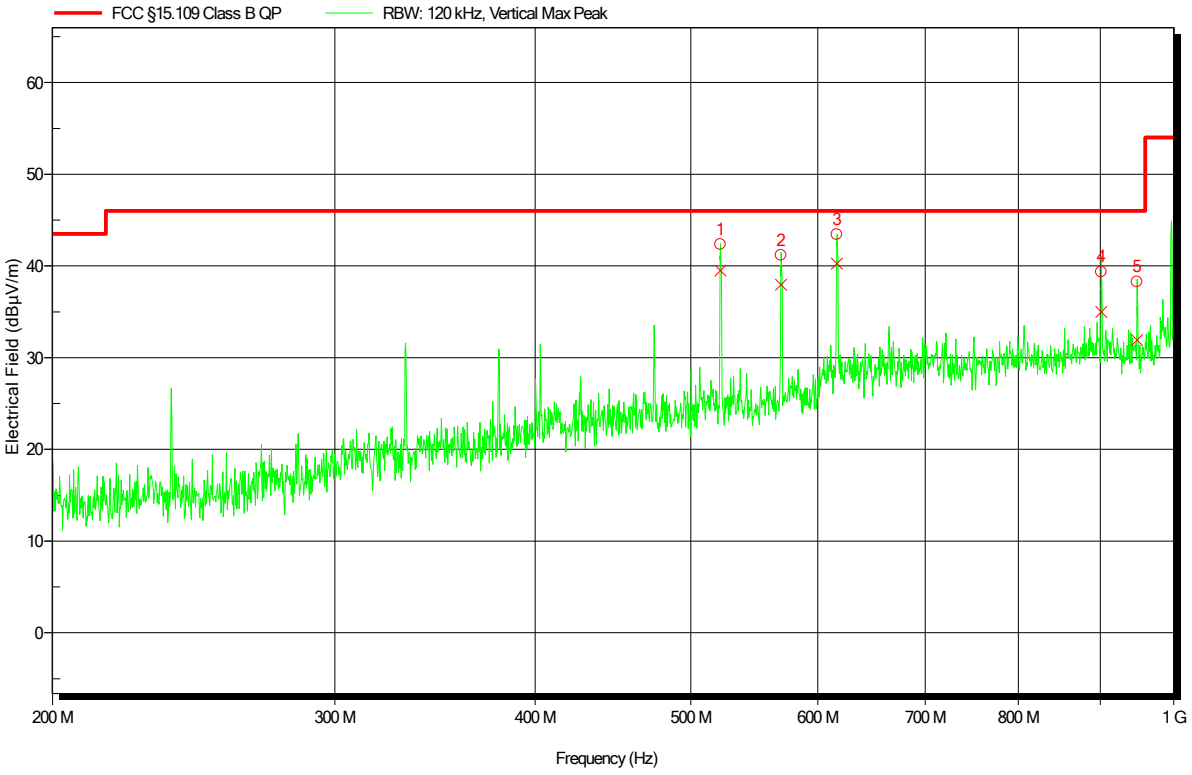


| Peak Number | Frequency | Quasi-Peak | Quasi-Peak Limit | Quasi-Peak Difference | Quasi-Peak Status | Angle | Height |
|---|---|---|---|---|---|---|---|
| 1 | 521.819 MHz | 39.5 dBµV/m | 46.02 dBµV/m | -6.52 dB | Pass | 0 Degree | 1 m |
| 2 | 569.204 MHz | 37.95 dBµV/m | 46.02 dBµV/m | -8.08 dB | Pass | 0 Degree | 1 m |
| 3 | 616.662 MHz | 40.26 dBµV/m | 46.02 dBµV/m | -5.76 dB | Pass | 0 Degree | 1 m |
| 4 | 901.261 MHz | 35 dBµV/m | 46.02 dBµV/m | -11.02 dB | Pass | 0 Degree | 1 m |
| 5 | 948.604 MHz | 31.9 dBµV/m | 46.02 dBµV/m | -14.12 dB | Pass | 0 Degree | 1 m |

## Radiated emissions according to FCC part 15B

| | |
|---|---|
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| Applicant: | dresden elektronik ingenieurtechnik gmbh |
| Model Description: | Zigbee Radio Module for Raspberry Pi |
| Model: | RaspBee II |
| Test Sample ID: | 1 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Mr. Liebich |
| Test Date: | 2019-12-16 |
| Operating Conditions: | ambient temperature: 24 °C<br>power input: 120 V / 60 Hz |
| Antenna: | Schwarzbeck BBHA 9120D, Horizontal |
| Measurement Distance: | 3m |
| Mode: | 1 |

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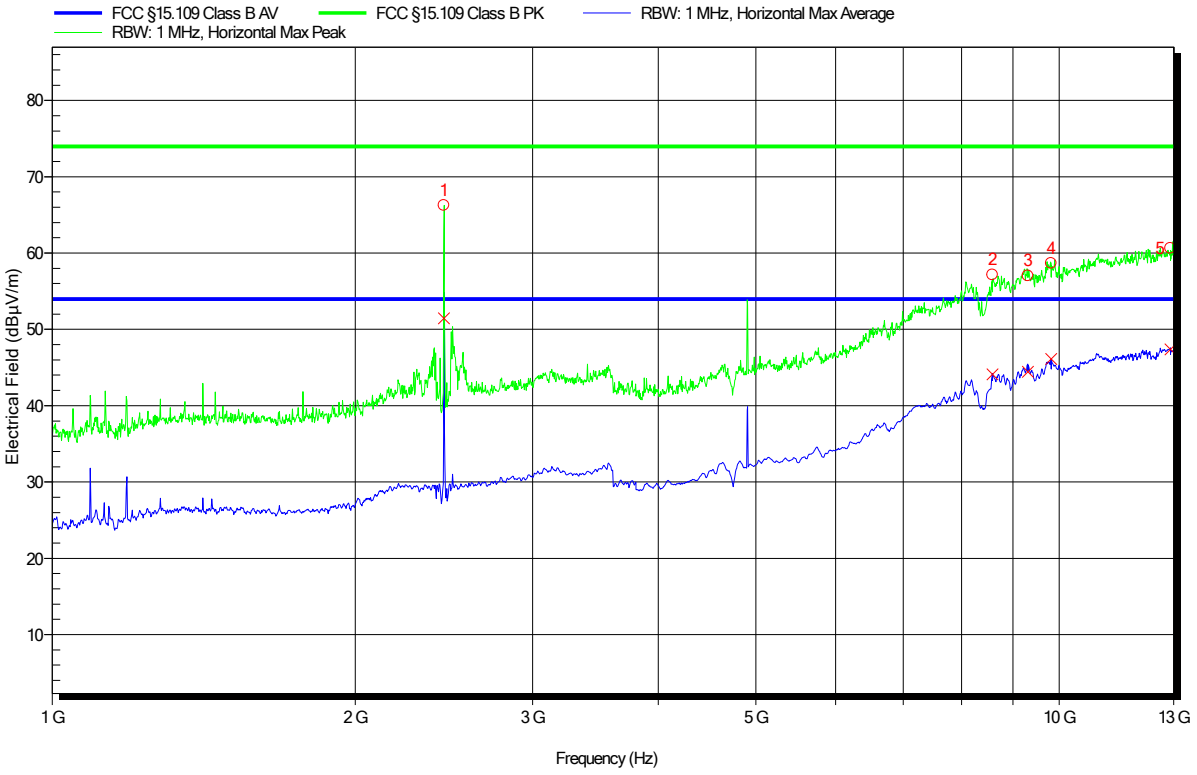


| Peak Number | Frequency | Peak | Peak Limit | Peak Difference | Peak Status | Angle | Height |
|---|---|---|---|---|---|---|---|
| 1 | 2.451 GHz | | ZigBee-Carrier | | | 0 Degree | 1 m |
| 2 | 8.585 GHz | 57.14 dBµV/m | 73.98 dBµV/m | -16.84 dB | Pass | 0 Degree | 1 m |
| 3 | 9.312 GHz | 57.03 dBµV/m | 73.98 dBµV/m | -16.95 dB | Pass | 0 Degree | 1 m |
| 4 | 9.82 GHz | 58.65 dBµV/m | 73.98 dBµV/m | -15.33 dB | Pass | 0 Degree | 1 m |
| 5 | 12.9 GHz | 60.64 dBµV/m | 73.98 dBµV/m | -13.34 dB | Pass | 0 Degree | 1 m |

| Peak Number | Frequency | Average | Average Limit | Average Difference | Average Status | Angle | Height |
|---|---|---|---|---|---|---|---|
| 1 | 2.451 GHz | | ZigBee-Carrier | | | 0 Degree | 1 m |
| 2 | 8.585 GHz | 44.1 dBµV/m | 53.98 dBµV/m | -9.88 dB | Pass | 0 Degree | 1 m |
| 3 | 9.312 GHz | 44.44 dBµV/m | 53.98 dBµV/m | -9.54 dB | Pass | 0 Degree | 1 m |
| 4 | 9.82 GHz | 46.11 dBµV/m | 53.98 dBµV/m | -7.87 dB | Pass | 0 Degree | 1 m |
| 5 | 12.9 GHz | 47.37 dBµV/m | 53.98 dBµV/m | -6.61 dB | Pass | 0 Degree | 1 m |

## Radiated emissions according to FCC part 15B

| | |
|---|---|
| Project Number: | G0M-1910-8555 |
| Applicant: | dresden elektronik ingenieurtechnik gmbh |
| Model Description: | Zigbee Radio Module for Raspberry Pi |
| Model: | RaspBee II |
| Test Sample ID: | 1 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Mr. Liebich |
| Test Date: | 2019-12-16 |
| Operating Conditions: | ambient temperature: 24 °C<br>power input: 120 V / 60 Hz |
| Antenna: | Schwarzbeck BBHA 9120D, Vertical |
| Measurement Distance: | 3m |
| Mode: | 1 |

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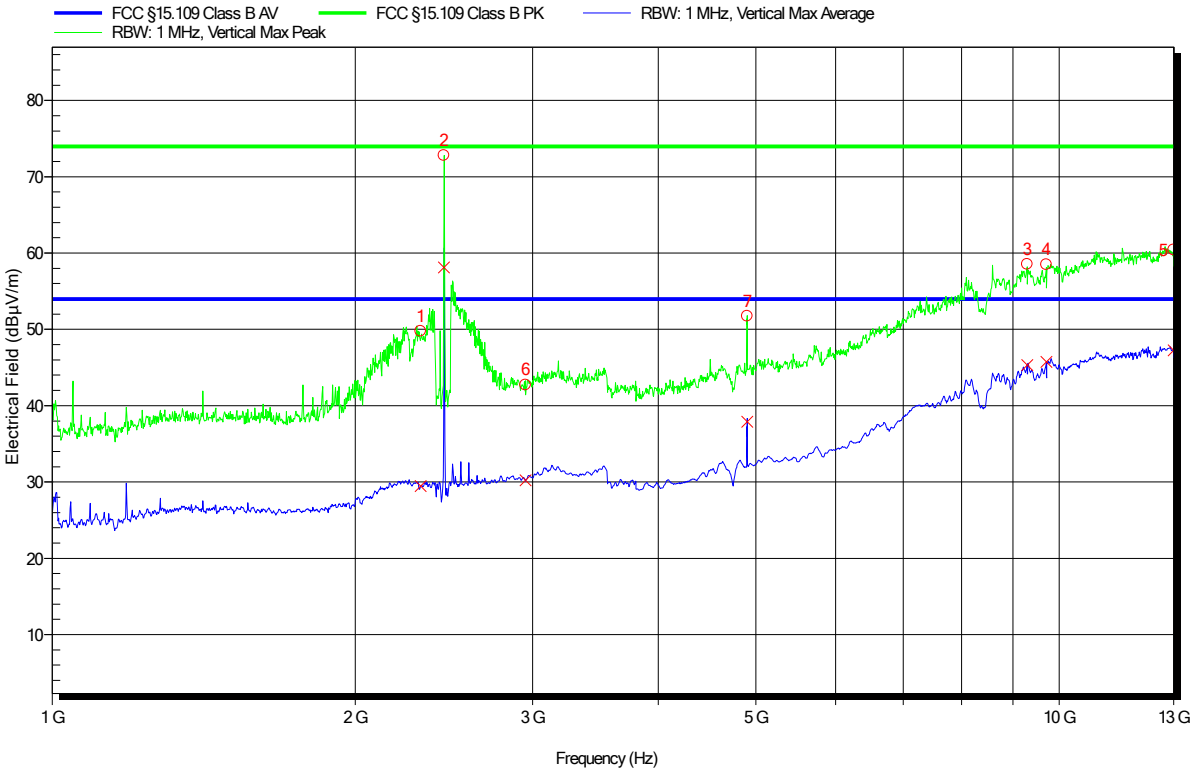



| Peak Number | Frequency | Peak | Peak Limit | Peak Difference | Peak Status | Angle | Height |
|---|---|---|---|---|---|---|---|
| 1 | 2.323 GHz | 49.77 dBµV/m | 73.98 dBµV/m | -24.21 dB | Pass | 0 Degree | 1 m |
| 2 | 2.451 GHz | | ZigBee-Carrier | | | 0 Degree | 1 m |
| 3 | 9.302 GHz | 58.52 dBµV/m | 73.98 dBµV/m | -15.46 dB | Pass | 0 Degree | 1 m |
| 4 | 9.717 GHz | 58.51 dBµV/m | 73.98 dBµV/m | -15.47 dB | Pass | 0 Degree | 1 m |
| 5 | 12.998 GHz | 60.41 dBµV/m | 73.98 dBµV/m | -13.57 dB | Pass | 0 Degree | 1 m |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | 2.952 GHz | 42.71 dBµV/m | 73.98 dBµV/m | -31.27 dB | Pass | 0 Degree | 1 m |
| 7 | 4.901 GHz | 51.76 dBµV/m | 73.98 dBµV/m | -22.22 dB | Pass | 0 Degree | 1 m |

| Peak Number | Frequency | Average | Average Limit | Average Difference | Average Status | Angle | Height |
|---|---|---|---|---|---|---|---|
| 1 | 2.323 GHz | 29.47 dBµV/m | 53.98 dBµV/m | -24.51 dB | Pass | 0 Degree | 1 m |
| 2 | 2.451 GHz | | ZigBee-Carrier | | | 0 Degree | 1 m |
| 3 | 9.302 GHz | 45.3 dBµV/m | 53.98 dBµV/m | -8.68 dB | Pass | 0 Degree | 1 m |
| 4 | 9.717 GHz | 45.72 dBµV/m | 53.98 dBµV/m | -8.26 dB | Pass | 0 Degree | 1 m |
| 5 | 12.998 GHz | 47.26 dBµV/m | 53.98 dBµV/m | -6.72 dB | Pass | 0 Degree | 1 m |
| 6 | 2.952 GHz | 30.24 dBµV/m | 53.98 dBµV/m | -23.74 dB | Pass | 0 Degree | 1 m |
| 7 | 4.901 GHz | 37.91 dBµV/m | 53.98 dBµV/m | -16.07 dB | Pass | 0 Degree | 1 m |

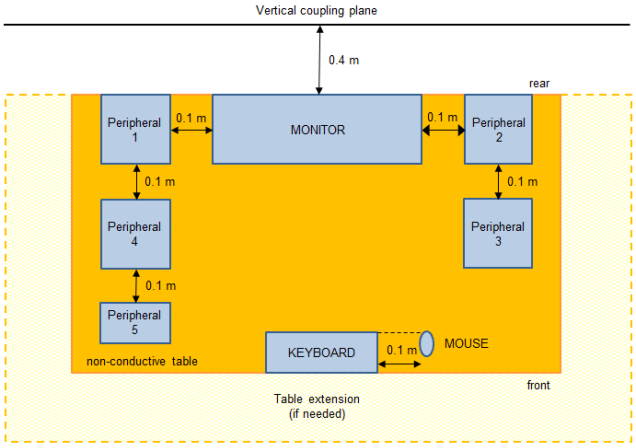
## 2.2 Test Conditions and Results - Conducted emissions acc. to ANSI C63.4

### 2.2.1 Information

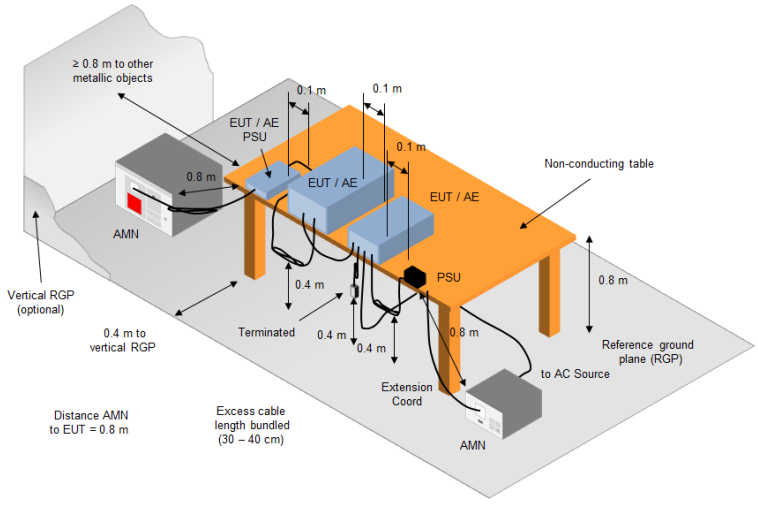
| Test Information | |
|---|---|
| Reference | FCC 15.107, ICES-003, 8, 6.2 |
| Reference method | ANSI C63.4:2014 Section 12 |
| Measurement range | 150 kHz to 30 MHz |
| Equipment class | Class B |
| Equipment type | Table top |
| Temperature [°C] | 23 |
| Humidity [%] | 29 |
| Operator | Stephan Liebich |
| Date | 2019-12-16 |

### 2.2.2 Setup

**Equipment placement**




**Test Setup**



2.2.3 Equipment

| Test Software | | | |
|---|---|---|---|
| Description | Manufacturer | Name | Version |
| EMC Software | DARE Instruments | Radimation | 2016.1.10 |

| Test Equipment | | | | | |
|---|---|---|---|---|---|
| Description | Manufacturer | Model | Identifier | Cal. Date | Cal. Due |
| AMN | R&S | ESH3-Z5 | EF00036 | 2019-07 | 2021-07 |
| Pulse Limiter | R&S | ESH3-Z2 | EF01063 | 2019-07 | 2020-07 |
| EMI Test Receiver | R&S | ESR 7 | EF00943 | 2019-10 | 2020-10 |
| Climatic Sensor | Embedded Data Systems, LLC. | 2800100000254 17E | EF01054 | 2019-05 | 2020-05 |

2.2.4 Procedure

| Exploratory measurement |
|---|
| 1. The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1) |
| 2. The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN. |
| 3. The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length). |
| 4. The LISN measurement port was connected to a measurement receiver |
| 5. I/O cables were bundled not longer than 0.4 m |
| 6. Measurement was performed in the frequency range 0.15 – 30MHz on each current-carrying conductor |
| 7. To maximize the emissions the cable positions were manipulated |
| 8. The worst configuration of EUT and cables is shown on a test setup picture at item 1.3 |

| Final measurement |
|---|
| 1. The EUT was placed on a non conductive table 0.8 m above the reference ground plane and 0.4 m away from the vertical conducting plane (ANSI C63.4: 2014 item 7.3.1) |
| 2. The power cord that is normally supplied or recommended by the manufacturer was connected to the LISN. |
| 3. The distance between the outer edge of the EUT and the LISN shall be set to 0.8 m. A longer power cord shall be bundled to this length (bundling shall not exceed 40 cm in length). |
| 4. The LISN measurement port was connected to a measurement receiver |
| 5. The EUT and cable arrangement were based on the exploratory measurement results |
| 6. The test data of the worst-case conditions were recorded and shown on the next pages |

2.2.5 Limits

| Class B | | |
|---|---|---|
| Frequency [MHz] | Quasi-peak Limit [dBµV] | Average Limit [dBµV] |
| 0.15 - 0.5 | 66 - 56 * | 56 - 46 * |
| 0.5 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |
| * Decreases with the logarithm of the frequency | | |

2.2.6 Results

| AC power line conducted emissions | | | | | |
|---|---|---|---|---|---|
| Port | Coupling | Operational mode | EUT Configuration | Verdict | Remark |
| POWER | AMN | 1 | 1 | PASS | - |

2.2.7 Setup Photos

| TEST SETUP CONDUCTED EMISSION |
|---|
|  |

2.2.8 Records

## Conducted emissions at the mains power port according to FCC part 15B

| | |
|---|---|
| Project Number: | G0M-1910-8555 |
| Applicant: | dresden elektronik ingenieurtechnik gmbh |
| Model Description: | Zigbee Radio Module for Raspberry Pi |
| Model: | RaspBee II |
| Test Sample ID: | 1 |
| Test Site: | Eurofins Product Service GmbH |
| Operator: | Mr. Liebich |
| Test Date: | 2019-12-16 |
| Operating Conditions: | ambient temperature: 23 °C<br>power input: 120 V / 60 Hz |
| LISN: | Rohde & Schwarz ESH3-Z5 |
| Mode: | 1 |
| Applied to Port: | POWER |

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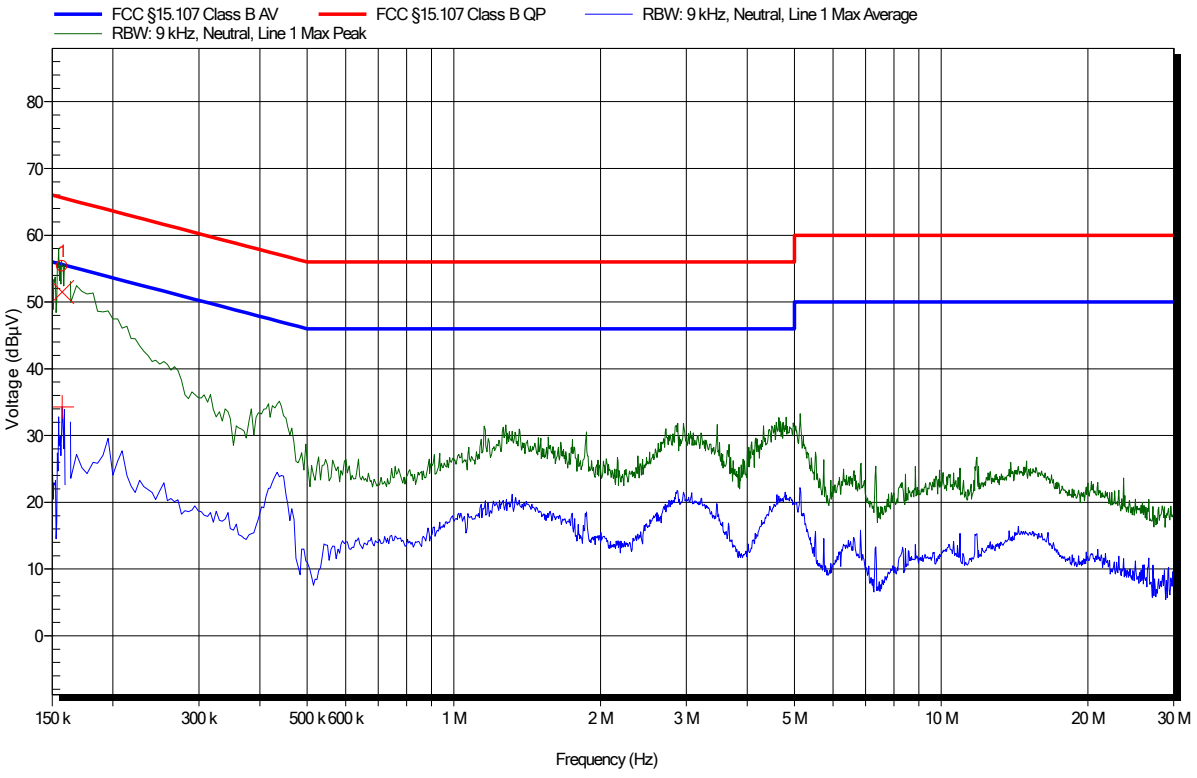


| Peak Number | Frequency | Quasi-Peak | Quasi-Peak Limit | Quasi-Peak Difference | Quasi-Peak Status | LISN |
|---|---|---|---|---|---|---|
| 1 | 157.2 kHz | 51.49 dBµV | 65.61 dBµV | -14.12 dB | Pass | Neutral |

| Peak Number | Frequency | Average | Average Limit | Average Difference | Average Status | LISN |
|---|---|---|---|---|---|---|
| 1 | 157.2 kHz | 34.26 dBµV | 55.61 dBµV | -21.35 dB | Pass | Neutral |