

Test report No:
2331052R-RF-US-P20V01

SAR Exemption Evaluation Report

| | |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Product Name | LoRa+Wi-Fi+GNSS Module |
| TradeMark | Murata |
| Model and /or type reference | LBAA0XV2DT |
| FCC ID | VPYLB2DT |
| Applicant's name / address | Murata Manufacturing Co., Ltd. 10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan |
| Test method requested, standard | FCC Part1.1307 KDB 447498 D04V01 |
| Verdict Summary | IN COMPLIANCE |
| Documented By (name / position & signature) | Feng Jiao/ Project Engineer  |
| Approved by (name / position & signature) | Jack Zhang/ Manager  |
| Date of issue | 2023-10-23 |
| Report Version | V1.0 |
| Report template No | Template_FCC MPE-RF-V1.0 |

INDEX

| | page |
|--------------------------------------------------|------|
| Competences and Guarantees..... | 3 |
| General conditions..... | 3 |
| Environmental conditions..... | 3 |
| Possible test case verdicts..... | 4 |
| Abbreviations | 4 |
| Document History | 5 |
| Remarks and Comments | 5 |
| 1. RF Exposure Evaluation..... | 6 |
| 1.1. Limits | 6 |
| 1.2. Test Procedure | 7 |
| 1.3. Test Result of RF Exposure Evaluation | 7 |

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In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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GENERAL CONDITIONS

| | |
|----------------------|------------------------------------------------------------------------|
| Test Location | No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China |
| Date(receive sample) | May. 15, 2023 |
| Date (start test) | May. 16, 2023 |
| Date (finish test) | Oct. 09, 2023 |

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
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4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

| | |
|-----------------------|--------------|
| Ambient temperature | 15°C - 35 °C |
| Relative Humidity air | 30% - 60% |

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

| | |
|-----------------------------------------|-----------------|
| Test case does not apply to test object | N/A |
| Test object does meet requirement | P (Pass) / PASS |
| Test object does not meet requirement | F (Fail) / FAIL |
| Not measured | N/M |

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

| | |
|------|-------------------------------|
| EUT | : Equipment Under Test |
| QP | : Quasi-Peak |
| CAV | : CISPR Average |
| AV | : Average |
| CDN | : Coupling Decoupling Network |
| SAC | : Semi-Anechoic Chamber |
| OATS | : Open Area Test Site |
| BW | : Bandwidth |
| AM | : Amplitude Modulation |
| PM | : Pulse Modulation |
| HCP | : Horizontal Coupling Plane |
| VCP | : Vertical Coupling Plane |
| UN | : Nominal voltage |
| Tx | : Transmitter |
| Rx | : Receiver |
| N/A | : Not Applicable |
| N/M | : Not Measured |

DOCUMENT HISTORY

| Report No. | Version | Description | Issued Date |
|-----------------------|---------|--------------------------|-------------|
| 2331052R-RF-US-P20V01 | V1.0 | Initial issue of report. | 2023-10-23 |
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REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with KDB 447498 and FCC Part 1.1307
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, it is not necessary to account the uncertainty associated with the measurement result.
4. The test results presented in this report relate only to the object tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 Antenna information.

1. RF Exposure Evaluation

1.1. Limits

According to § 1.1307(b)(3)(i)(B)

The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

Finally, when 10-g extremity SAR applies, SAR test exemption may be considered by applying a factor of 2.5 to the SAR-based exemption threshold.

1.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

1.3. Test Result of RF Exposure Evaluation

| | | |
|-----------|---|------------------------|
| Product | : | LoRa+Wi-Fi+GNSS Module |
| Test Item | : | RF Exposure Evaluation |
| Test Site | : | AC-6 |

Antenna information

| | | | |
|-----------------------------------|-------------------------------------|---------------|--------------------------------------------------|
| Antenna model / type number | ignion NN03-310 | | |
| Antenna serial number | N/A | | |
| Antenna Delivery | <input checked="" type="checkbox"/> | 1TX + 1RX | |
| | <input type="checkbox"/> | 2TX + 2RX | |
| | <input type="checkbox"/> | Others: | |
| Antenna technology | <input checked="" type="checkbox"/> | SISO | |
| | <input type="checkbox"/> | MIMO | <input type="checkbox"/> CDD |
| | | | <input type="checkbox"/> Beam-forming |
| Antenna Type | <input checked="" type="checkbox"/> | External | <input type="checkbox"/> Dipole |
| | | | <input checked="" type="checkbox"/> chip antenna |
| | | | <input type="checkbox"/> Sectorized |
| | | | <input type="checkbox"/> PCB |
| | <input type="checkbox"/> | Internal | <input type="checkbox"/> PIFA |
| | | | <input type="checkbox"/> PCB |
| | | | <input type="checkbox"/> Dipole |
| Antenna Gain | | | <input type="checkbox"/> Others: |
| Antenna Gain | 0.3 dBi | | |

Note 1: The antenna information for the EUT in clause 1.3 are provided and confirmed by the client.

The tune-up power is 0.5 dB, so the maximum conducted power we used to calculate RF exposure is 21.61dBm for LoRa .

| Band | Exposure Condition | Pmax | Pmax | ERP | Distance | f(GHz) | Pth (mW) | SAR Test |
|------|--------------------|-------|--------|-------|----------|--------|----------|--------------|
| | | (dBm) | (mw) | (mw) | (mm) | | | |
| LoRa | body | 21.62 | 144.88 | 88.31 | 40 | 0.9078 | 174.2 | Not required |

Conclusion: SAR was not required at 40mm from the body.

_____ The End _____