

|                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                              |                                   |                                                                             |                                                                                       |                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------|
| <b>Prüfbericht-Nr.:</b><br>Test Report No.:                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>JP232NN1 001</b>                                                                                                                                                                                                          |                                   | <b>Auftrags-Nr.:</b><br>Order No.:                                          | <b>150277637,</b><br><b>150277641</b>                                                 | <b>Seite 1 von 65</b><br>Page 1 of 65 |
| <b>Kunden-Referenz-Nr.:</b><br>Client Reference No.:                                                                                                                                                                                                                                                                                                                                                                                                          | N/A                                                                                                                                                                                                                          |                                   | <b>Auftragsdatum:</b><br>Order Date:                                        | 2023-04-27                                                                            |                                       |
| <b>Auftraggeber:</b><br>Client:                                                                                                                                                                                                                                                                                                                                                                                                                               | HOUWA SYSTEM DESIGN K.K.<br>3-22-14 Higashi, Shibuya-ku, Tokyo, 150-0011 JAPAN                                                                                                                                               |                                   |                                                                             |                                                                                       |                                       |
| <b>Prüfgegenstand:</b><br>Test Item:                                                                                                                                                                                                                                                                                                                                                                                                                          | BLE Module                                                                                                                                                                                                                   |                                   |                                                                             |                                                                                       |                                       |
| <b>Bezeichnung / Typ-Nr.:</b><br>Identification / Type No.:                                                                                                                                                                                                                                                                                                                                                                                                   | BLEAD-MOD33QDNA (Model A),<br>BLEAD-MOD33QDA (Model B)                                                                                                                                                                       | <b>Serien-Nr.:</b><br>Serial No.: | NA00000001 (Model A),<br>A500000001 (Model B)                               |                                                                                       |                                       |
| <b>Auftrags-Inhalt:</b><br>Order Content:                                                                                                                                                                                                                                                                                                                                                                                                                     | Radio Testing                                                                                                                                                                                                                |                                   |                                                                             |                                                                                       |                                       |
| <b>Prüfgrundlage:</b><br>Test Specification:                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>FCC 47 CFR Part 15, Subpart C, Section 15.247</b><br>ANSI C63.10-2013<br>KDB Publication No. 558074 D01: Guidance for Performing Compliance<br>Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 |                                   |                                                                             |                                                                                       |                                       |
| <b>Wareneingangsdatum:</b><br>Date of Receipt:                                                                                                                                                                                                                                                                                                                                                                                                                | 2023-09-08                                                                                                                                                                                                                   |                                   |                                                                             |                                                                                       |                                       |
| <b>Prüfmuster-Nr.:</b><br>Test Sample No.:                                                                                                                                                                                                                                                                                                                                                                                                                    | A003565791                                                                                                                                                                                                                   |                                   |                                                                             |                                                                                       |                                       |
| <b>Prüfzeitraum:</b><br>Testing Period:                                                                                                                                                                                                                                                                                                                                                                                                                       | 2023-09-08 - 2023-09-25                                                                                                                                                                                                      |                                   |                                                                             |                                                                                       |                                       |
| <b>Ort der Prüfung:</b><br>Place of Testing:                                                                                                                                                                                                                                                                                                                                                                                                                  | Yokohama EMC Laboratory                                                                                                                                                                                                      |                                   |                                                                             |                                                                                       |                                       |
| <b>Prüflaboratorium:</b><br>Testing Laboratory:                                                                                                                                                                                                                                                                                                                                                                                                               | TÜV Rheinland Japan Ltd.                                                                                                                                                                                                     |                                   |                                                                             |                                                                                       |                                       |
| <b>Prüfergebnis*:</b><br>Test Result*:                                                                                                                                                                                                                                                                                                                                                                                                                        | Pass                                                                                                                                                                                                                         |                                   |                                                                             |                                                                                       |                                       |
| <b>Überprüft von:</b><br>Reviewed by:                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                           |                                   | <b>Genehmigt von:</b><br>Authorized by:                                     |  |                                       |
| <b>Datum:</b> 2023-10-18<br>Date:                                                                                                                                                                                                                                                                                                                                                                                                                             | Daisuke Watanuki                                                                                                                                                                                                             |                                   | <b>Datum:</b> 2023-10-18<br>Date:                                           | Pin Zhang                                                                             |                                       |
| <b>Stellung / Position:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   | Inspector                                                                                                                                                                                                                    |                                   | <b>Stellung / Position:</b>                                                 | Reviewer                                                                              |                                       |
| <b>Sonstiges / Other:</b><br>BLEAD-MOD33QDNA (Model A), BLEAD-MOD33QDA (Model B) are identical except antennas. BLEAD-MOD33QDNA has UFL antenna connector for an external antenna. BLEAD-MOD33QDA has an integrated antenna which is not detachable. These 2 models are subject to certification application under one common FCC ID. Model A is subject to full assessment according to Part 15.247 while Model B is subject to radiated spurious test only. |                                                                                                                                                                                                                              |                                   |                                                                             |                                                                                       |                                       |
| <b>Zustand des Prüfgegenstandes bei Anlieferung:</b><br>Condition of the Test Item at Delivery:                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                              |                                   | Prüfmuster vollständig und unbeschädigt<br>Test item complete and undamaged |                                                                                       |                                       |
| * Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet<br>* Legend: P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested                                                                                                                                                                      |                                                                                                                                                                                                                              |                                   |                                                                             |                                                                                       |                                       |
| <b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b><br>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.                |                                                                                                                                                                                                                              |                                   |                                                                             |                                                                                       |                                       |

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 2 von 65  
Page 2 of 65

## REVISIONS

| Report No.   | Issue date | Changes / Remarks |
|--------------|------------|-------------------|
| JP232NN1 001 | 2023-10-18 | Original document |

## Contents

|            |                                                          |           |
|------------|----------------------------------------------------------|-----------|
| <b>1.</b>  | <b>GENERAL REMARKS.....</b>                              | <b>5</b>  |
| <b>1.1</b> | <b>TEST SPECIFICATIONS .....</b>                         | <b>5</b>  |
| <b>1.2</b> | <b>TEST REPORT PURPOSE.....</b>                          | <b>5</b>  |
| <b>1.3</b> | <b>COMPLEMENTARY MATERIALS .....</b>                     | <b>5</b>  |
| <b>2.</b>  | <b>TEST SITES.....</b>                                   | <b>6</b>  |
| <b>2.1</b> | <b>TEST FACILITIES .....</b>                             | <b>6</b>  |
| <b>2.2</b> | <b>LIST OF TEST AND MEASUREMENT INSTRUMENTS .....</b>    | <b>7</b>  |
| <b>2.3</b> | <b>MEASUREMENT UNCERTAINTY .....</b>                     | <b>9</b>  |
| <b>3.</b>  | <b>GENERAL PRODUCT INFORMATION .....</b>                 | <b>10</b> |
| <b>3.1</b> | <b>PRODUCT FUNCTION AND INTENDED USE .....</b>           | <b>10</b> |
| <b>3.2</b> | <b>RATINGS AND SYSTEM DETAILS .....</b>                  | <b>10</b> |
| <b>3.3</b> | <b>NOISE GENERATING AND NOISE SUPPRESSING PARTS.....</b> | <b>10</b> |
| <b>3.4</b> | <b>SUBMITTED DOCUMENTS AND INFORMATION .....</b>         | <b>11</b> |
| <b>4.</b>  | <b>TEST SETUP AND OPERATION MODES.....</b>               | <b>12</b> |
| <b>4.1</b> | <b>TEST METHODOLOGY .....</b>                            | <b>12</b> |
| <b>4.2</b> | <b>OPERATION MODES.....</b>                              | <b>12</b> |
| <b>4.3</b> | <b>PHYSICAL CONFIGURATION FOR TESTING.....</b>           | <b>12</b> |
| <b>4.4</b> | <b>TEST SOFTWARE.....</b>                                | <b>13</b> |
| <b>4.5</b> | <b>SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT.....</b>  | <b>14</b> |
| <b>4.6</b> | <b>COUNTERMEASURES TO ACHIEVE COMPLIANCE.....</b>        | <b>14</b> |
| <b>5.</b>  | <b>TEST RESULTS RADIO .....</b>                          | <b>15</b> |
| <b>5.1</b> | <b>TECHNICAL REQUIREMENTS .....</b>                      | <b>15</b> |
| 5.1.1      | Supply Voltage Requirements .....                        | 15        |
| 5.1.2      | Antenna Requirements.....                                | 15        |
| 5.1.3      | Restricted Bands of Operation.....                       | 16        |
| <b>5.2</b> | <b>CONDUCTED MEASUREMENTS AT ANTENNA PORT .....</b>      | <b>17</b> |
| 5.2.1      | Maximum Peak Output Power .....                          | 17        |
| 5.2.2      | 6dB Bandwidth.....                                       | 21        |
| 5.2.3      | 99% Bandwidth .....                                      | 24        |
| 5.2.4      | Conducted Spurious Emissions.....                        | 28        |
| 5.2.5      | Peak Power Spectral Density .....                        | 33        |
| <b>5.3</b> | <b>RADIATED MEASUREMENTS .....</b>                       | <b>37</b> |
| 5.3.1      | Radiated Spurious Emissions of Transmitter.....          | 37        |

|       |                                                      |    |
|-------|------------------------------------------------------|----|
| 5.4   | AC POWER LINE CONDUCTED MEASUREMENTS .....           | 53 |
| 5.4.1 | AC Power Line Conducted Emission of Transmitter..... | 53 |
| 7.    | PHOTOGRAPHS OF THE TEST SETUP .....                  | 56 |
| 8.    | LIST OF TABLES.....                                  | 63 |
| 9.    | LIST OF FIGURES.....                                 | 64 |
| 10.   | LIST OF PHOTOGRAPHS .....                            | 65 |

## 1. General Remarks

### 1.1 Test Specifications

**Table 1: Test Summary**

| Test                                                                               | Specifications              | Result    |
|------------------------------------------------------------------------------------|-----------------------------|-----------|
| <b>Radio:</b><br>FCC 47 CFR Part 15, Subpart C, Section 15.247<br>ANSI C63.10-2013 |                             |           |
| Maximum Peak Output Power                                                          | FCC 15.247(b)(3)            | Pass      |
| 6dB Bandwidth                                                                      | FCC 15.215(c), 15.247(a)(2) | Pass      |
| 99% Bandwidth                                                                      | For reference               | Performed |
| Conducted Spurious Emissions                                                       | FCC 15.247(d)               | Pass      |
| Peak Power Spectral Density                                                        | FCC 15.247(e)               | Pass      |
| Radiated Spurious Emissions of Transmitter                                         | FCC 15.247(d)               | Pass      |
| Conducted Emission on AC Power Ports                                               | FCC 15.207                  | Pass      |

### 1.2 Test Report Purpose

The purpose of this test report is to show compliance of the EUT (Equipment Under Test) with the requirements of the FCC rules listed in section 1.1 for original grant application.

### 1.3 Complementary Materials

There is no attachment to this test report.

## 2. Test Sites

### 2.1 Test Facilities

TÜV Rheinland Japan Ltd. – Global Technology Assessment Center  
4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan

The used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The test facility is recognized by the Federal Communications Commission (FCC) as Accredited Testing Laboratory under designation number JP0017.

The test facility is accredited by VLAC (member of ILAC) under number VLAC-017 according to ISO/IEC 17025:2017.

Prüfbericht-Nr.: **JP232NN1 001**  
Test Report No.:

Seite 7 von 65  
Page 7 of 65

## 2.2 List of Test and Measurement Instruments

**Table 2: List of Test and Measurement Equipment**

| Kind of Equipment                                                        | Manufacturer     | Model Name       | Serial Number    | Equip. ID | Cal. Interval | Cal. Date  | Next Cal.  |
|--------------------------------------------------------------------------|------------------|------------------|------------------|-----------|---------------|------------|------------|
| <b>For Power Port and Telecommunication Port Conducted Emission (CE)</b> |                  |                  |                  |           |               |            |            |
| Conducted Emission Measurement Software                                  | Toyo Corporation | EP9/CE           | Ver. 4.2.010     | RF-0810   | N/A           | N/A        | N/A        |
| EMI Receiver                                                             | Rohde & Schwarz  | ESU 8            | 100025           | RF-0020   | 1 year        | 2023-03-17 | 2024-03-17 |
| LISN                                                                     | Rohde & Schwarz  | ENV216           | 100276           | RF-0016   | 1 year        | 2023-05-16 | 2024-05-16 |
| LISN                                                                     | Rohde & Schwarz  | ENV216           | 101958           | RF-0708   | 1 year        | 2023-05-16 | 2024-05-16 |
| <b>For Radiated Emission (RE)</b>                                        |                  |                  |                  |           |               |            |            |
| Radiated Emission Measurement Software (below 30MHz)                     | Toyo Corporation | EP5/ME           | Ver. 5.2.10      | RF-0172   | N/A           | N/A        | N/A        |
| Radiated Emission Measurement Software (above 30MHz)                     | Toyo Corporation | EP7/RE           | VER. 8.0.90      | RF-0026   | N/A           | N/A        | N/A        |
| EMI Receiver                                                             | Rohde & Schwarz  | ESU 8            | 100025           | RF-0020   | 1 year        | 2023-03-17 | 2024-03-17 |
| EMI Receiver                                                             | Rohde & Schwarz  | ESW 26           | 101316           | RF-0812   | 1 year        | 2023-05-26 | 2024-05-26 |
| RF Selector (10m Chamber)                                                | Toyo Corporation | NS4900           | 0703-182         | RF-0029   | N/A           | N/A        | N/A        |
| Loop Antenna with Amplifier, 9kHz-30MHz                                  | Rohde & Schwarz  | HFH2-Z2          | 100139           | RF-0048   | 1 year        | 2023-05-26 | 2024-05-26 |
| Trilog Antenna No. 2, 30-1000MHz                                         | Schwarzbeck      | VULB 9168        | 9168-475         | RF-0462   | 1 year        | 2023-05-30 | 2024-05-30 |
| 5dB Attenuator                                                           | Pasternack       | PE7047-5         | -                | RF-0731   | 1 year        | 2023-05-29 | 2024-05-29 |
| Low Noise Preamplifier, 9kHz-1GHz                                        | TSJ              | MLA-10K01-B01-35 | 1370750          | RF-0253   | 1 year        | 2022-12-21 | 2023-12-21 |
| Low Pass Filter, DC-1GHz                                                 | R&K              | LP1000CH 3       | 12104001         | RF-0515   | 1 year        | 2022-12-22 | 2023-12-22 |
| Horn Antenna, 1-8GHz                                                     | Schwarzbeck      | BBHA9120 D       | 9120D-2280       | RF-0845   | 1 year        | 2023-03-18 | 2024-03-18 |
| Microwave Preamplifier, 1-8GHz                                           | Toyo Corporation | TPA0108-40       | 0634             | RF-0052   | 1 year        | 2022-12-21 | 2023-12-21 |
| Band Reject Filter, 1-8GHz                                               | Nitsuki          | NF-49BT          | 027              | RF-0131   | 1 year        | 2022-12-21 | 2023-12-21 |
| Horn Antenna with Preamplifier, 6-18GHz (RX)                             | Toyo Corporation | HAP06-18W        | B1510452 210-123 | RF-1095   | N/A           | N/A        | N/A        |
| High Pass Filter, 8-18GHz                                                | Micro-Tronics    | HPM50107         | G089             | RF-1094   | 1 year        | 2022-11-24 | 2023-11-24 |

| Kind of Equipment                                                     | Manufacturer     | Model Name | Serial Number    | Equip. ID | Cal. Interval | Cal. Date  | Next Cal.  |
|-----------------------------------------------------------------------|------------------|------------|------------------|-----------|---------------|------------|------------|
| Horn Antenna with Preamplifier, 18-26.5GHz (RX)                       | Toyo Corporation | HAP18-26W  | B2010482 210-125 | RF-1096   | 1 year        | 2022-11-24 | 2023-11-24 |
| Constant Voltage Constant Frequency Stabilizers and Power Accessories |                  |            |                  |           |               |            |            |
| CVCF (Shielded Room)                                                  | NF Corporation   | ES2000S    | 9075612          | RF-0210   | 1 year        | 2023-03-24 | 2024-03-24 |
| CVCF Booster (Shielded Room)                                          | NF Corporation   | ES2000B    | 9074403          | RF-0211   | 1 year        | 2023-03-24 | 2024-03-24 |
| CVCF (10m Chamber)                                                    | NF Corporation   | ES2000U    | 9067307          | RF-0212   | 1 year        | 2023-03-24 | 2024-03-24 |
| CVCF Booster (10m Chamber)                                            | NF Corporation   | ES2000B    | 9074408          | RF-0213   | 1 year        | 2023-03-24 | 2024-03-24 |
| DC Power Supply (*)                                                   | Kikusui          | PWR800L    | NA003235         | PV-0039   | N/A           | N/A        | N/A        |
| True RMS Multimeter                                                   | Fluke            | 87V        | 97680445         | RF-0281   | 1 year        | 2022-12-08 | 2023-12-08 |
| For Antenna Port Conducted Emission                                   |                  |            |                  |           |               |            |            |
| EMI Receiver                                                          | Rohde & Schwarz  | ESU 40     | 100029           | RF-0021   | 1 year        | 2023-09-11 | 2024-09-11 |
| EMI Receiver                                                          | Rohde & Schwarz  | ESW 26     | 101316           | RF-0812   | 1 year        | 2023-05-26 | 2024-05-26 |
| DC Power Supply (*)                                                   | Agilent          | E3646A     | MY503500 07      | RF-0412   | N/A           | N/A        | N/A        |
| True RMS Multimeter                                                   | Fluke            | 87V        | 97680445         | RF-0281   | 1 year        | 2022-12-08 | 2023-12-08 |

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025 has been confirmed before testing.

(\*) This equipment is calibrated or validated before testing by using calibrated equipment.

## 2.3 Measurement Uncertainty

**Table 3: Emission Measurement Uncertainty**

| Measurement Type                 | Frequency    | Uncertainty |
|----------------------------------|--------------|-------------|
| Antenna Port Conducted Emission  | 20Hz - 40GHz | ±1.5dB      |
| Radiated Emission                | 9kHz - 30MHz | ±4.8dB      |
|                                  | 30MHz - 1GHz | ±6.0dB      |
|                                  | > 1GHz       | ±5.2dB      |
| AC Power Line Conducted Emission | 150k – 30MHz | ±3.3dB      |

**Note:**

The measurement instrumentation uncertainty (MIU) was determined according to CISPR 16-4-2 and ETSI TR 100-028. All MIU values mentioned in the above table are smaller than the uncertainty budgets specified by CISPR 16-4-2 and ETSI TR 100-028, therefore compliance for all emission measurements is deemed to occur if no measured disturbance level exceeds the disturbance limit.

### 3. General Product Information

#### 3.1 Product Function and Intended Use

The **EUT** (Equipment Under Test) is a Bluetooth Low Energy module for multi host devices.

#### 3.2 Ratings and System Details

|                        |                                                |
|------------------------|------------------------------------------------|
| Radio standard:        | Bluetooth 5.1                                  |
| Frequency range:       | 2402 – 2480MHz                                 |
| Antenna gain:          | 2.24dBi (Model A), 0.79dBi (Model B)           |
| Antenna type:          | Mono-pole (Model A), Pattern Antenna (Model B) |
| Antenna mounting type: | External (Model A), Internal (Model B)         |
| Modulation type:       | GFSK                                           |
| Signal spreading:      | None                                           |
| Transmit speed:        | 1 Mbps, 2 Mbps                                 |
| Number of channels:    | 40                                             |
| Channel spacing:       | 2MHz                                           |
| Rated temperature:     | 0 to 75°C                                      |
| Rated voltage:         | 1.7 ~ 3.6VDC, 3VDC for normal                  |
| Rated input Current:   | Not specified                                  |
| Protection class:      | III                                            |
| Test voltage:          | DC 3V                                          |

#### 3.3 Noise Generating and Noise Suppressing Parts

The highest frequency generated or used by the EUT is 2480MHz as maximum fundamental frequency of incorporated Bluetooth SoC.

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 11 von 65  
Page 11 of 65

### 3.4 Submitted Documents and Information

Following information provided in this test report has been submitted by the client:

- client name and address;
- EUT identification, ratings, system details, and description of product function and intended use;
- information related to noise generating and noise suppressing parts (if any).

## 4. Test Setup and Operation Modes

### 4.1 Test Methodology

The test methodology used is based on the requirements of 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209, 15.247.

The test methods, which have been used, are based on ANSI C63.10.

For details, see under each test item.

### 4.2 Operation Modes

Testing was performed at the lowest operating frequency (2402MHz), at the operating frequency in the middle of the specified frequency band (2440MHz) and at the highest operating frequency (2480MHz).

The basic operation modes used for testing are:

- A. EUT transmits a modulated signal at lowest channel (2402MHz)
- B. EUT transmits a modulated signal at middle channel (2440MHz)
- C. EUT transmits a modulated signal at middle channel (2480MHz)

Configurations:

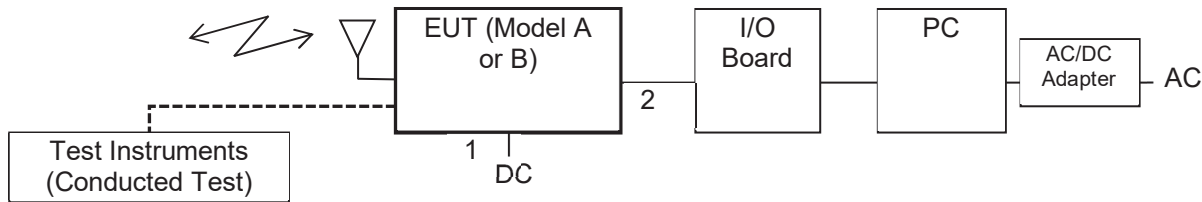
- 1M. 1Mbps (1M PHY)
- 2M. 2Mbps (2M PHY)

### 4.3 Physical Configuration for Testing

The test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.10.

Figure 1: Block Diagram



Note: The antenna is attached only when radiated test is performed. It is removed and test instruments are connected to its antenna port instead when conducted test is performed.

Table 4: Interfaces present on the EUT

| No. | Interface(s): | Max. Cable Length, Shielding | Cable Classification |
|-----|---------------|------------------------------|----------------------|
| 1.  | DC Input      | 0.2m, Un-shielded            | DC Power Line        |
| 2.  | Control Cable | 0.2m, Un-shielded            | Signal Line          |

Note:  
For more details, refer to section: Photographs of the Test Set-Up.

4.4 Test Software

The EUT was provided by the manufacturer with suitable software to allow operation in all the required modes.

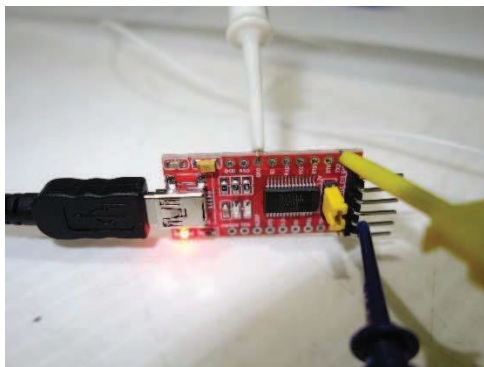
Software used for testing: Tera Term version 4.106 (SVN#9298) by Tera Term Project

## 4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. Product: I/O Board  
Manufacturer: N/A  
Model: N/A

### Photograph 1: I/O Board



2. Product: PC  
Manufacturer: FFF Smart Life Connected Corporation  
Model: FFF-PCM2B  
Rated Voltage: 12V  
Input Current: 2.0A  
Serial Number: M222120335
3. Product: AC/DC Adapter  
Manufacturer: FFF Smart Life Connected Corporation  
Model: JZ8024  
Rated Voltage: 100-240V  
Input Current: 0.7A  
Frequency: 50/60Hz  
Serial Number: 120200D

## 4.6 Countermeasures to achieve Compliance

No additional measures were employed to achieve compliance.

## 5. Test Results RADIO

### 5.1 Technical Requirements

#### 5.1.1 Supply Voltage Requirements

**RESULT:****PASS**

Requirements:

FCC 15.31(e)

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Verdict:

The EUT has an internal voltage regulator to supply the RF circuit. Hence it complies with the supply voltage requirements.

#### 5.1.2 Antenna Requirements

**RESULT:****PASS**

Requirements:

FCC 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Verdict:

The EUTs have mono-pole antenna (Model A) with a unique connector and on-board pattern antenna (Model B) which are not easily accessible for modification. Hence it complies with the antenna requirements.

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 16 von 65  
Page 16 of 65

### 5.1.3 Restricted Bands of Operation

**RESULT:****PASS**

Requirements:

FCC 15.205

Only spurious emissions are permitted in any of the restricted frequency bands, unless otherwise specified.

Verdict:

The EUT operation frequency range is 2400-2483.5MHz. Therefore only spurious emissions may be found in the restricted bands of operation and the EUT complies with the restricted frequency band requirement.

## 5.2 Conducted Measurements at Antenna Port

### 5.2.1 Maximum Peak Output Power

**RESULT:****PASS**

Date of testing: 2023-09-25

Ambient temperature: 25°C

Relative humidity: 74%

Atmospheric pressure: 1009hPa

Operation Modes: A ~ C

Configurations: 1M, 2M

Tested Models: Model A

**Requirements:**

FCC 15.247(b)(3)

For systems using digital modulation in the 2400-2483.5MHz band, the maximum peak output power is 1W (30dBm).

If transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

**Test procedure:**

KDB Publication No. 558074 D01.

The maximum peak output power was measured at the antenna port with a spectrum analyzer using a peak detector. The resolution bandwidth and the video bandwidth were set to 3MHz and 10MHz.

The readings of the measurements take into account the loss generated by all the involved cables.

The measurement was performed at all the available data rates (1M and 2Mbps) in order to identify the one producing the highest output power.

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 18 von 65  
Page 18 of 65**Table 5: Maximum Peak Output Power, 1Mbps**

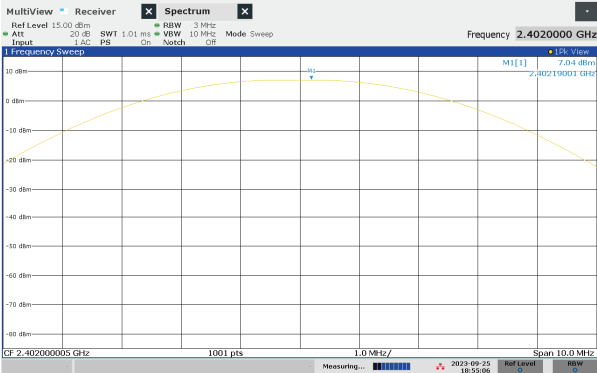
| Freq. [MHz] | Peak Output Power [dBm] | Limit [dBm] | Margin [dB] |
|-------------|-------------------------|-------------|-------------|
| 2402        | 7.35                    | 30          | 22.65       |
| 2440        | 7.33                    | 30          | 22.67       |
| 2480        | 7.11                    | 30          | 22.89       |

**Table 6: Maximum Peak Output Power, 2Mbps**

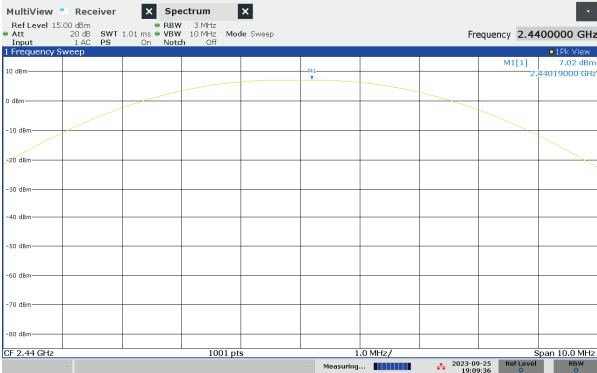
| Freq. [MHz] | Peak Output Power [dBm] | Limit [dBm] | Margin [dB] |
|-------------|-------------------------|-------------|-------------|
| 2402        | 7.36                    | 30          | 22.64       |
| 2440        | 7.34                    | 30          | 22.66       |
| 2480        | 7.11                    | 30          | 22.89       |

Note: These measured values in the tables above were corrected with extra RF cable loss 0.31dB.

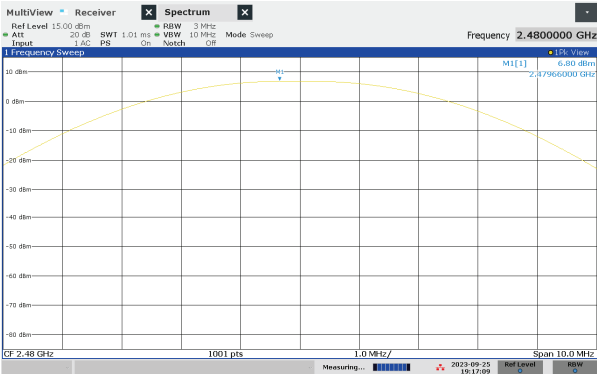
Figure 2: Maximum Peak Output Power, Mode A ~ C, 1Mbps



06:55:07 PM 09/25/2023

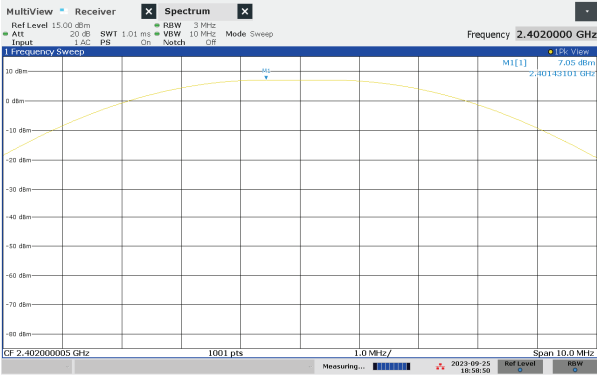


07:09:37 PM 09/25/2023

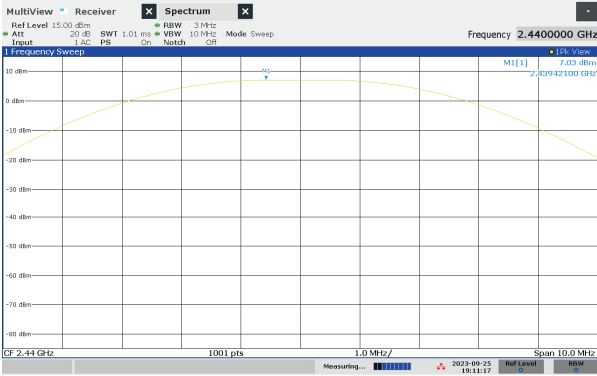


07:17:10 PM 09/25/2023

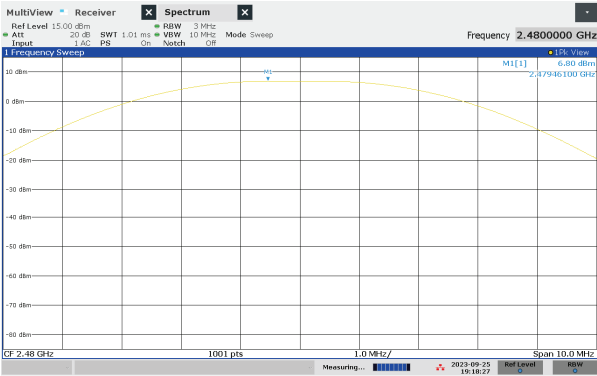
Figure 3: Maximum Peak Output Power, Mode A ~ C, 2Mbps



06:58:51 PM 09/25/2023



07:11:17 PM 09/25/2023



07:18:27 PM 09/25/2023

## 5.2.2 6dB Bandwidth

### RESULT:

**PASS**

Date of testing: 2023-09-14, 2023-09-15

 Ambient temperature: 25, 24°C  
 Relative humidity: 73, 74%  
 Atmospheric pressure: 1006, 1009hPa

 Operation Modes: A ~ C  
 Configurations: 1M, 2M  
 Tested Models: Model A

### Requirements:

FCC 15.215(c) and 15.247(a)(2)

For systems using digital modulation in the 2400-2483.5MHz band, the 6dB bandwidth shall be at least 500kHz.

### Test procedure:

KDB Publication No. 558074 D01.

The 6dB bandwidth was measured at the antenna port with a spectrum analyzer using a peak detector. The resolution bandwidth was set to 100kHz and the video bandwidth to 300kHz. Markers placed at the lowest and highest intersections of the trace with a 6dBc line were used to calculate the emission bandwidth.

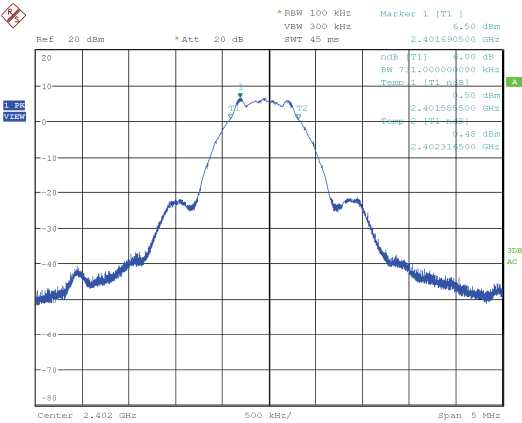
**Table 7: 6dB Bandwidth, 1Mbps**

| Operating Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [MHz] |
|---------------------------|---------------------|-------------|
| 2402                      | 0.73                | 0.5         |
| 2440                      | 0.72                | 0.5         |
| 2480                      | 0.70                | 0.5         |

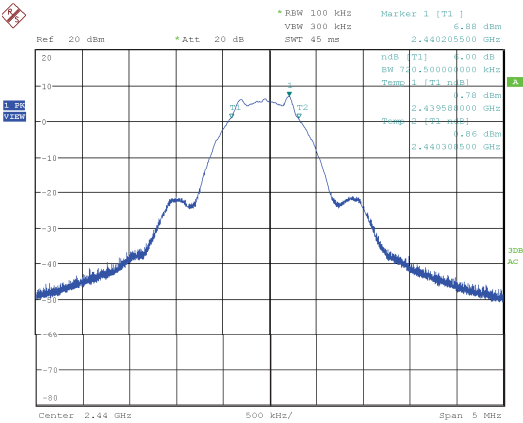
**Table 8: 6dB Bandwidth, 2Mbps**

| Operating Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [MHz] |
|---------------------------|---------------------|-------------|
| 2402                      | 1.20                | 0.5         |
| 2440                      | 1.22                | 0.5         |
| 2480                      | 1.24                | 0.5         |

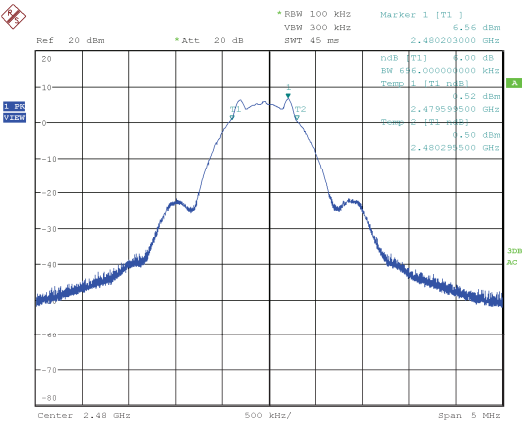
Figure 4: 6dB Bandwidth, Mode A ~ C, 1Mbps



Date: 16.SEP.2023 14:19:59

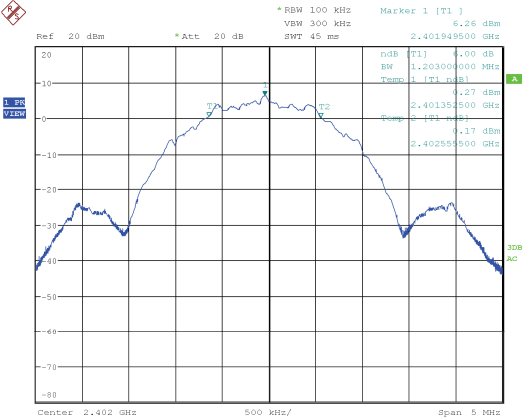


Date: 16.SEP.2023 14:17:21

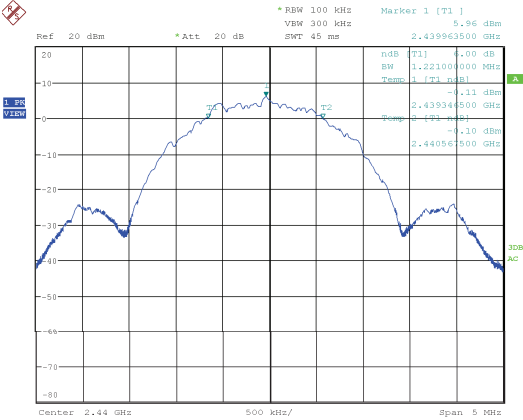


Date: 16.SEP.2023 14:23:42

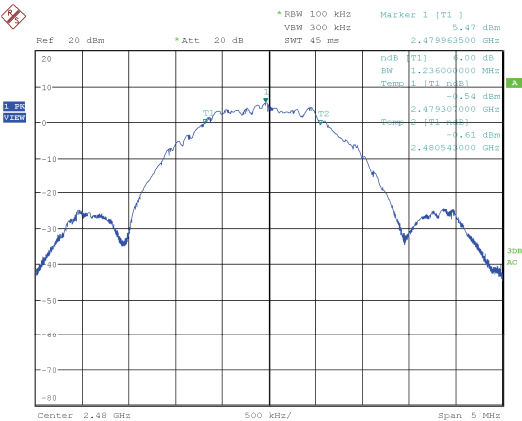
Figure 5: 6dB Bandwidth, Mode A ~ C, 2Mbps



Date: 16.SEP.2023 14:37:30



Date: 16.SEP.2023 14:33:23



Date: 16.SEP.2023 14:27:01

Prüfbericht-Nr.: **JP232NN1 001**  
Test Report No.:Seite 24 von 65  
Page 24 of 65

### 5.2.3 99% Bandwidth

**RESULT:****PERFORMED**

Date of testing: 2023-09-14, 2023-09-15

Ambient temperature: 25, 24°C

Relative humidity: 73, 74%

Atmospheric pressure: 1006, 1009hPa

Operation Modes: A ~ C

Configurations: 1M, 2M

Tested Models: Model A

Test procedure:

ANSI C63.10 §6.9.3

The 99% bandwidth was measured at the antenna port with a spectrum analyzer using a peak detector. The value of the emission bandwidth was obtained by using the OBW function of the analyzer with a 99% coverage setting.

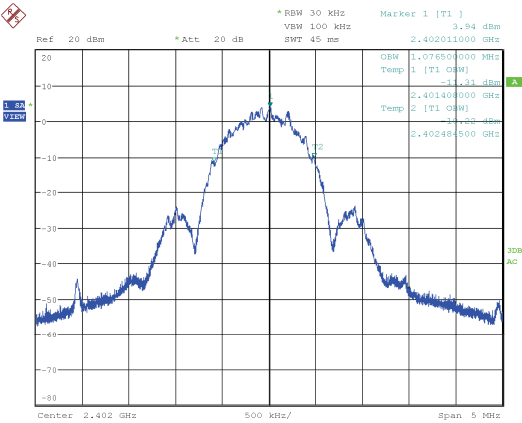
Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 25 von 65  
Page 25 of 65**Table 9: 99% Bandwidth and Edge Frequencies, 1Mbps**

| Operating Frequency [MHz] | 99% Bandwidth [MHz] | Edge Frequency [MHz] | Limit [MHz] | Margin [MHz] |
|---------------------------|---------------------|----------------------|-------------|--------------|
| 2402                      | 1.08                | 2401.4               | 2400        | 1.4          |
| 2440                      | 1.07                | ---                  | ---         | ---          |
| 2480                      | 1.06                | 2480.5               | 2483.5      | 3.0          |

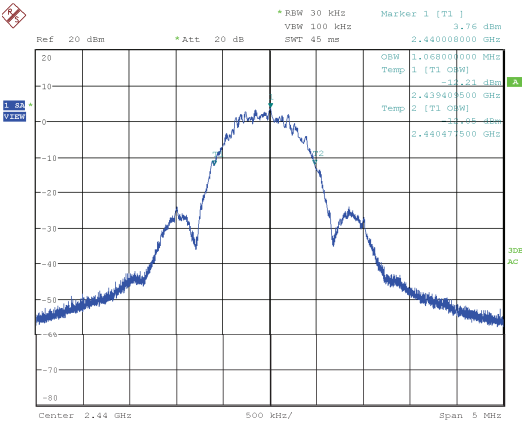
**Table 10: 99% Bandwidth and Edge Frequencies, 2Mbps**

| Operating Frequency [MHz] | 99% Bandwidth [MHz] | Edge Frequency [MHz] | Limit [MHz] | Margin [MHz] |
|---------------------------|---------------------|----------------------|-------------|--------------|
| 2402                      | 2.09                | 2400.9               | 2400        | 0.9          |
| 2440                      | 2.11                | ---                  | ---         | ---          |
| 2480                      | 2.10                | 2481.0               | 2483.5      | 2.5          |

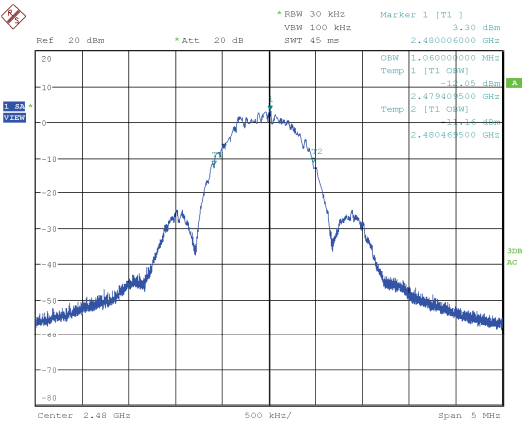
Figure 6: 99% Bandwidth, Mode A ~ C, 1Mbps



Date: 16.SEP.2023 15:12:09

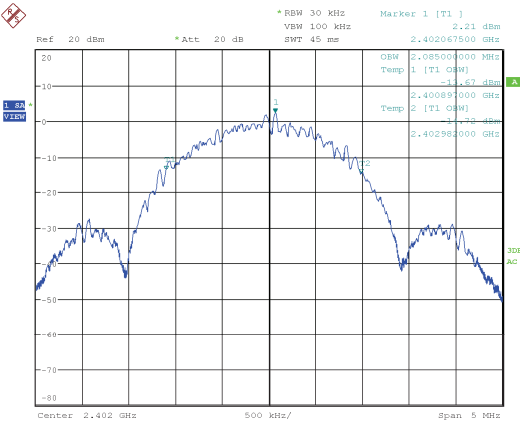


Date: 16.SEP.2023 15:09:04

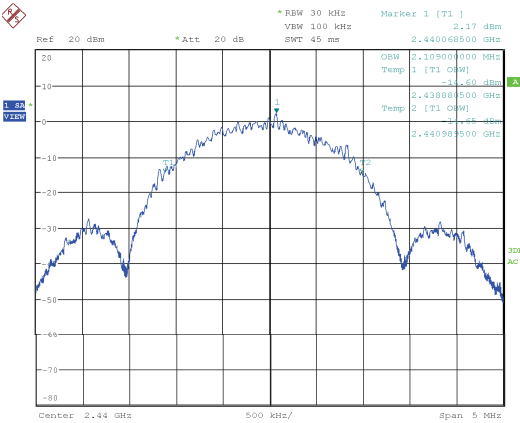


Date: 16.SEP.2023 15:06:17

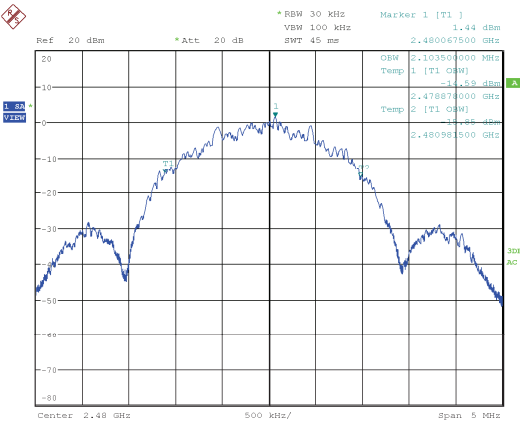
Figure 7: 99% Bandwidth, Mode A ~ C, 2Mbps



Date: 16.SEP.2023 14:54:19



Date: 16.SEP.2023 14:58:57



Date: 16.SEP.2023 15:02:56

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 28 von 65  
Page 28 of 65

## 5.2.4 Conducted Spurious Emissions

### RESULT:

**PASS**

Date of testing: 2023-09-14, 2023-09-15

Ambient temperature: 25, 24°C

Relative humidity: 73, 74%

Atmospheric pressure: 1006, 1009hPa

Operation Modes: A ~ C

Configurations: 1M, 2M

Tested Models: Model A

#### Requirements:

FCC 15.247(d)

In any 100kHz bandwidth outside the frequency band in which the intentional radiator is operating, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

#### Test procedure:

ANSI C63.10 §7.8.8.

The conducted spurious emissions were measured at the antenna port with a spectrum analyzer using a peak detector. The resolution bandwidth was set to 100kHz and the video bandwidth to 300kHz. Measurements were performed from 30MHz to 25GHz (10<sup>th</sup> harmonics).

The readings of the measurements take into account the loss generated by all the involved cables.

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 29 von 65  
Page 29 of 65**Table 11: Conducted Spurious Emissions, 30MHz – 25GHz, -20dB Limit to Peak Power, 1Mbps**

| Operating Frequency [MHz] | Fundamental Level [dBm] | Spurious Limit [dBm] | Measured Frequency [MHz] | Measured Level [dBm] | Margin [dB] |
|---------------------------|-------------------------|----------------------|--------------------------|----------------------|-------------|
| 2402                      | 4.87                    | -15.13               | 2273.55                  | -47.37               | 26.37       |
| 2440                      | 5.44                    | -14.56               | 2296.03                  | -45.18               | 30.62       |
| 2480                      | 5.75                    | -14.25               | 2606.90                  | -43.92               | 29.67       |

**Table 12: Conducted Spurious Emissions, 30MHz – 25GHz, -20dB Limit to Peak Power, 2Mbps**

| Operating Frequency [MHz] | Fundamental Level [dBm] | Spurious Limit [dBm] | Measured Frequency [MHz] | Measured Level [dBm] | Margin [dB] |
|---------------------------|-------------------------|----------------------|--------------------------|----------------------|-------------|
| 2402                      | 4.16                    | -15.84               | 2529.50                  | -45.20               | 29.36       |
| 2440                      | 5.43                    | -14.54               | 2566.95                  | -44.48               | 29.94       |
| 2480                      | 4.38                    | -15.62               | 2608.15                  | -43.31               | 27.69       |

**Table 13: Conducted Spurious Emissions, Band Edge, -20dB Limit to Peak Power, 1Mbps**

| Operating Frequency [MHz] | Fundamental Level [dBm] | Spurious Limit [dBm] | Measured Frequency [MHz] | Measured Level [dBm] | Margin [dB] |
|---------------------------|-------------------------|----------------------|--------------------------|----------------------|-------------|
| 2402                      | 6.95                    | -13.05               | 2400.00                  | -42.16               | 29.11       |
| 2480                      | 6.12                    | -13.88               | 2483.50                  | -54.87               | 40.99       |

**Table 14: Conducted Spurious Emissions, Band Edge, -20dB Limit to Peak Power, 2Mbps**

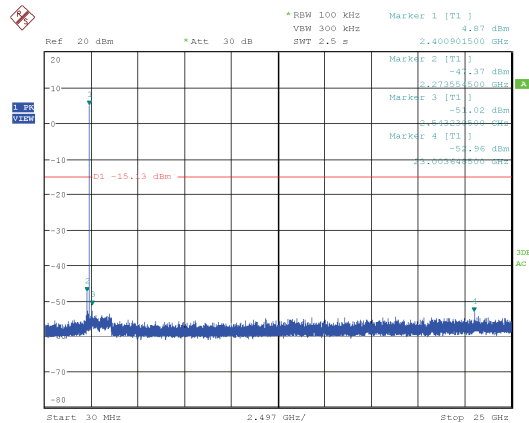
| Operating Frequency [MHz] | Fundamental Level [dBm] | Spurious Limit [dBm] | Measured Frequency [MHz] | Measured Level [dBm] | Margin [dB] |
|---------------------------|-------------------------|----------------------|--------------------------|----------------------|-------------|
| 2402                      | 5.73                    | -14.27               | 2400.00                  | -25.10               | 10.83       |
| 2480                      | 6.07                    | -13.93               | 2484.70                  | -53.67               | 39.74       |

Prüfbericht-Nr.:  
Test Report No.:

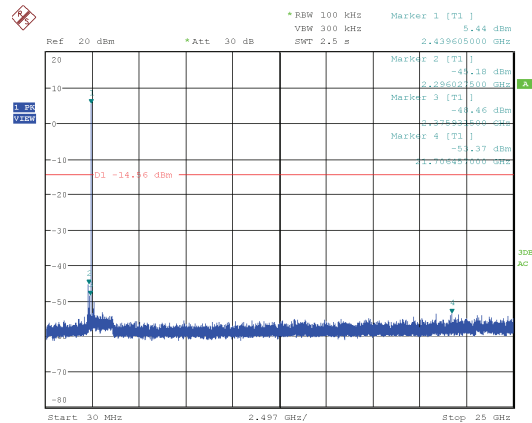
JP232NN1 001

Seite 30 von 65  
Page 30 of 65

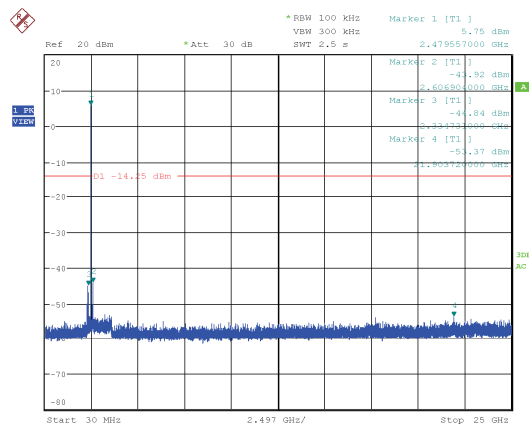
Figure 8: Conducted Spurious Emissions, 30MHz – 25GHz, Mode A ~ C, 1Mbps



Date: 16.SEP.2023 11:42:32



Date: 16.SEP.2023 11:44:53



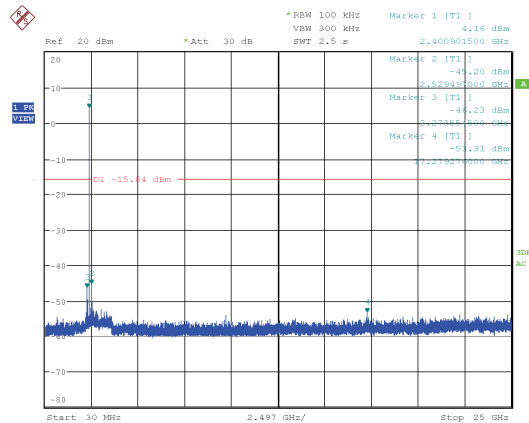
Date: 16.SEP.2023 11:47:25

Prüfbericht-Nr.:  
Test Report No.:

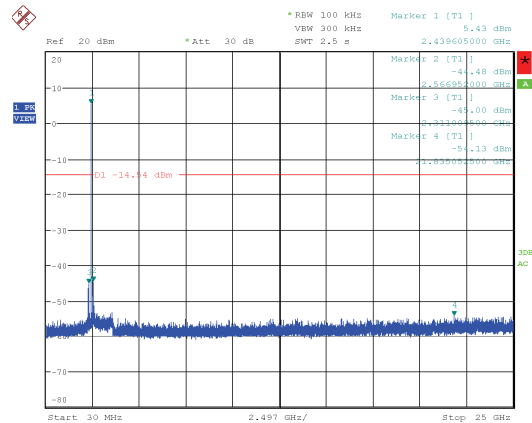
JP232NN1 001

Seite 31 von 65  
Page 31 of 65

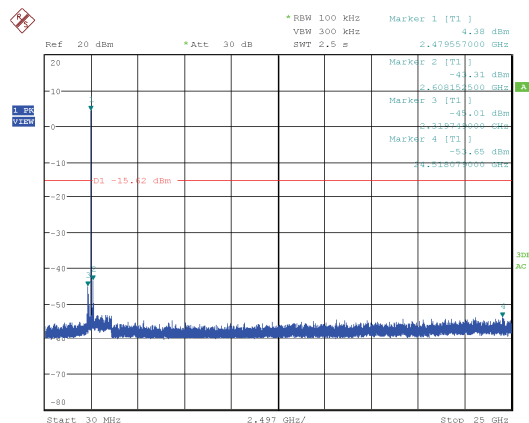
Figure 9: Conducted Spurious Emissions, 30MHz – 25GHz, Mode A ~ C, 2Mbps



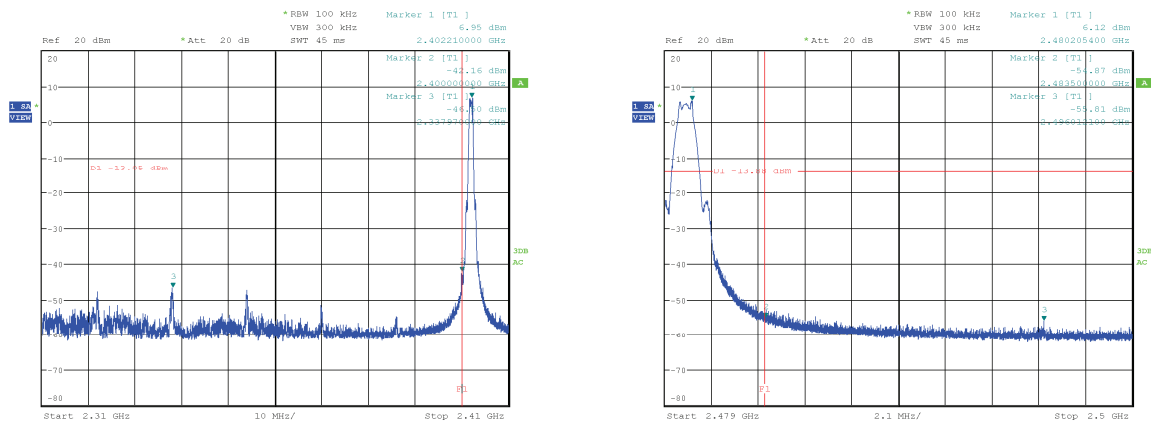
Date: 16.SEP.2023 11:35:23



Date: 16.SEP.2023 11:32:15

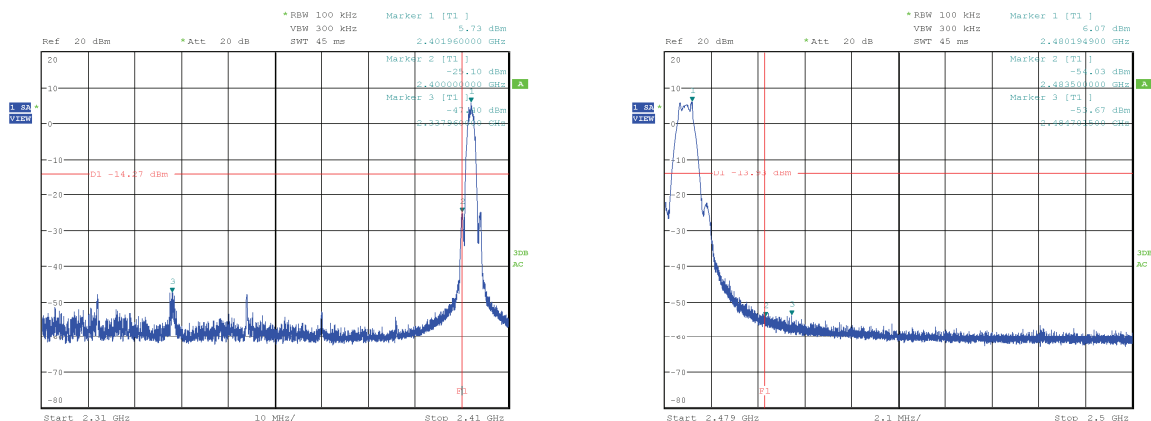


Date: 16.SEP.2023 11:38:57

Prüfbericht-Nr.:  
Test Report No.: **JP232NN1 001**Seite 32 von 65  
Page 32 of 65**Figure 10: Conducted Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 1Mbps**

Date: 20.SEP.2023 14:50:31

Date: 20.SEP.2023 13:55:36

**Figure 11: Conducted Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 2Mbps**

Date: 20.SEP.2023 14:25:47

Date: 20.SEP.2023 14:04:24

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 33 von 65  
Page 33 of 65

### 5.2.5 Peak Power Spectral Density

**RESULT:****PASS**

Date of testing: 2023-09-14, 2023-09-15

Ambient temperature: 25, 24°C

Relative humidity: 73, 74%

Atmospheric pressure: 1006, 1009hPa

Operation Modes: A ~ C

Configurations: 1M, 2M

Tested Models: Model A

## Requirements:

FCC 15.247€

For digitally modulated systems, the power spectral density (PSD) conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

## Test procedure:

KDB Publication No. 558074 D01.

The peak power spectral density was measured at the antenna port with a spectrum analyzer using a peak detector with a resolution bandwidth of 3kHz and a video bandwidth of 10kHz.

The readings of the measurements take into account the loss generated by all the involved cables.

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 34 von 65  
Page 34 of 65**Table 15: Peak Power Spectral Density**

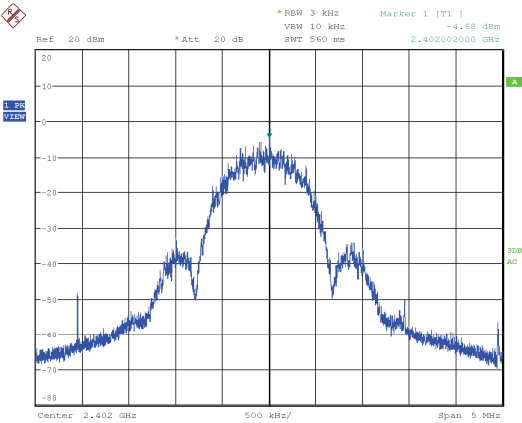
| Operating Frequency [MHz] | Max PSD Frequency [MHz] | Max PSD [dBm] | Limit [dBm] | Margin [dB] |
|---------------------------|-------------------------|---------------|-------------|-------------|
| 2402                      | 2402.00                 | -4.37         | 8.0         | 12.37       |
| 2440                      | 2439.85                 | -4.91         | 8.0         | 12.91       |
| 2480                      | 2480.00                 | -5.41         | 8.0         | 13.41       |

**Table 16: Peak Power Spectral Density**

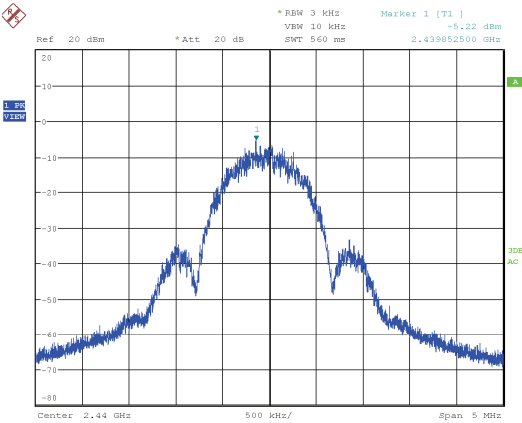
| Operating Frequency [MHz] | Max PSD Frequency [MHz] | Max PSD [dBm] | Limit [dBm] | Margin [dB] |
|---------------------------|-------------------------|---------------|-------------|-------------|
| 2402                      | 2402.13                 | -7.55         | 8.0         | 15.55       |
| 2440                      | 2439.86                 | -7.75         | 8.0         | 15.75       |
| 2480                      | 2480.00                 | -9.13         | 8.0         | 17.13       |

Note: These measured values in the tables above were corrected with extra RF cable loss 0.31dB.

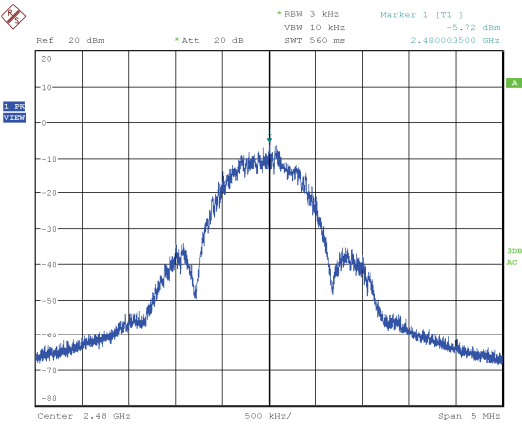
Figure 12: Power Spectral Density, Mode A ~ C, 1Mbps



Date: 16.SEP.2023 16:18:55

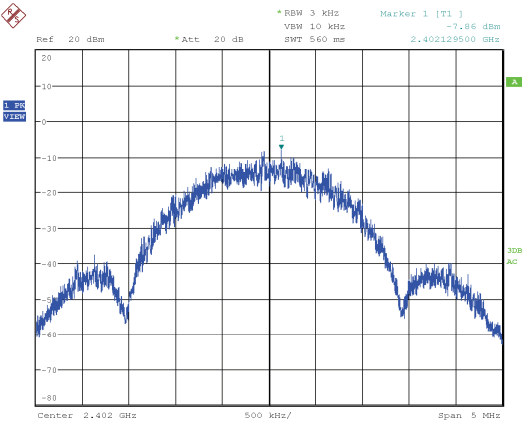


Date: 16.SEP.2023 16:20:58

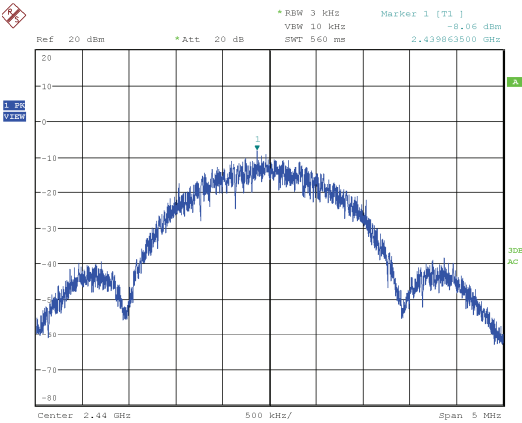


Date: 16.SEP.2023 16:25:20

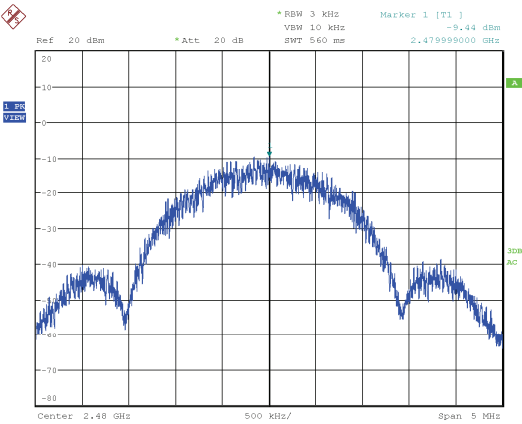
Figure 13: Power Spectral Density, Mode A ~ C, 2Mbps



Date: 16.SEP.2023 16:16:30



Date: 16.SEP.2023 16:13:42



Date: 16.SEP.2023 16:10:39

## 5.3 Radiated Measurements

### 5.3.1 Radiated Spurious Emissions of Transmitter

**RESULT:****PASS**

Date of testing: 2023-09-08, 2023-09-11, 2023-09-12  
2023-09-13

Ambient temperature: 26, 26, 23, 24°C  
Relative humidity: 43, 56, 54, 57%  
Atmospheric pressure: 1004, 1008, 1009, 1010hPa

Frequency range: 9kHz - 25GHz  
Measurement distance: 3m  
Kind of test site: Semi Anechoic Chamber  
Operation Modes: A ~ C  
Configurations: 1M, 2M  
Tested Models: Model A and B

**Requirements:**

FCC 15.205, FCC 15.209, FCC 15.247(d).

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a).

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a) or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

**Test procedure:**

The EUT was placed on a nonconductive turntable. The table height was 0.8m for measurements below 1GHz and 1.5m for measurements above 1GHz. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 9kHz to the 10th harmonic of the highest fundamental transmitter frequency (25GHz). Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° in order to determine the emission's maximum level. For frequencies above 30MHz, the antenna was raised and lowered from 1 to 4m and measurements were taken using both horizontal and vertical antenna polarizations.

For emissions between 30MHz and 1GHz, measurements were performed with a test receiver operating in the CISPR quasi-peak detection mode with a 20dB Bandwidth set to 120kHz. For emissions above 1GHz, measurements were performed with a spectrum analyzer using Peak and Average detector.

Absorbers have been placed on the floor between the EUT and the measuring antenna for testing above 1GHz.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.

Pre-check was performed to determine the worst orientation of the EUT from X, Y and Z axis in each test case and the final measurements were performed with the worst orientations.

For emissions below 1GHz, final measurements were performed with the worst case which was determined by pre-check.

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 39 von 65  
Page 39 of 65**Table 17: [Model A] Radiated Emissions, Quasi Peak Data, 9kHz - 30MHz, Mode B (2440MHz), 1Mbps, X axis**

| Freq. [MHz] | Reading QP [dBμV] | Factor [dB(1/m)] | Level QP [dBμV/m] | Limit [dBμV/m] | Margin QP [dB] | Angle [°] |
|-------------|-------------------|------------------|-------------------|----------------|----------------|-----------|
| 1.434       | 6.1               | 19.3             | 25.4              | 64.5           | 39.1           | 184       |

**Table 18: [Model A] Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 2Mbps, X axis**

| Freq. [MHz] | Antenna Orientation | Reading QP [dBμV] | Factor [dB(1/m)] | Level QP [dBμV/m] | Limit [dBμV/m] | Margin QP [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 47.671      | V                   | 53.9              | -20.7            | 33.2              | 40.0           | 6.8            | 100         | 339       |
| 59.590      | V                   | 51.2              | -21.3            | 29.9              | 40.0           | 10.1           | 104         | 1         |
| 62.566      | V                   | 55.3              | -21.6            | 33.7              | 40.0           | 6.3            | 104         | 88        |
| 65.549      | V                   | 54.9              | -21.9            | 33.0              | 40.0           | 7.0            | 100         | 10        |
| 68.524      | V                   | 54.9              | -22.3            | 32.6              | 40.0           | 7.4            | 100         | 37        |
| 71.504      | H                   | 49.2              | -22.9            | 26.3              | 40.0           | 13.7           | 294         | 148       |
| 71.507      | V                   | 61.4              | -22.9            | 38.5              | 40.0           | (*) 1.5        | 100         | 133       |
| 100.001     | H                   | 51.9              | -25.1            | 26.8              | 43.5           | 16.7           | 216         | 15        |
| 172.807     | V                   | 47.7              | -21.3            | 26.4              | 43.5           | 17.1           | 100         | 175       |
| 387.324     | V                   | 47.9              | -16.9            | 31.0              | 46.0           | 15.0           | 100         | 176       |

Note:

(\*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 40 von 65  
Page 40 of 65**Table 19: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4803.825    | H/X                 | 56.3              | -7.2             | 49.1              | 74             | 24.9           | 100         | 209       |
| 4803.867    | H/X                 | 56.6              | -7.2             | 49.4              | 74             | 24.6           | 113         | 199       |
| 4803.867    | V/X                 | 58.0              | -7.2             | 50.8              | 74             | 23.2           | 139         | 37        |
| 7205.601    | H/X                 | 54.6              | -0.1             | 54.5              | 74             | 19.5           | 197         | 304       |
| 7206.201    | V/X                 | 55.1              | -0.1             | 55.0              | 74             | 19.0           | 183         | 40        |
| 7206.210    | V/X                 | 55.7              | -0.1             | 55.6              | 74             | 18.4           | 197         | 33        |
| 9608.621    | V/Z                 | 52.6              | -8.3             | 44.3              | 74             | 29.7           | 165         | 302       |
| 19197.49    | V/Y                 | 56.5              | -11.0            | 45.5              | 74             | 28.5           | 115         | 270       |

**Table 20: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4803.825    | H/X                 | 44.0              | -7.2             | 36.8              | 54             | 17.2           | 100         | 209       |
| 4803.867    | H/X                 | 44.6              | -7.2             | 37.4              | 54             | 16.6           | 113         | 199       |
| 4803.867    | V/X                 | 48.6              | -7.2             | 41.4              | 54             | 12.6           | 139         | 37        |
| 7205.601    | H/X                 | 40.4              | -0.1             | 40.3              | 54             | 13.7           | 197         | 304       |
| 7206.201    | V/X                 | 42.3              | -0.1             | 42.2              | 54             | 11.8           | 183         | 40        |
| 7206.210    | V/X                 | 42.1              | -0.1             | 42.0              | 54             | 12.0           | 197         | 33        |
| 9608.621    | V/Z                 | 38.2              | -8.3             | 29.9              | 54             | 24.1           | 165         | 302       |
| 19197.49    | V/Y                 | 41.5              | -11.0            | 30.5              | 54             | 23.5           | 115         | 270       |

**Table 21: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4879.801    | H/X                 | 55.6              | -6.9             | 48.7              | 74             | 25.3           | 100         | 239       |
| 4920.547    | H/X                 | 55.3              | -6.7             | 48.5              | 74             | 25.5           | 179         | 137       |
| 4879.853    | V/X                 | 56.5              | -6.9             | 49.6              | 74             | 24.4           | 130         | 324       |
| 7295.944    | V/X                 | 54.4              | 0.3              | 54.7              | 74             | 19.3           | 193         | 98        |
| 7320.311    | V/X                 | 54.5              | 0.2              | 54.7              | 74             | 19.3           | 175         | 49        |
| 7296.105    | H/X                 | 54.8              | 0.3              | 55.1              | 74             | 18.9           | 152         | 205       |
| 12200.88    | H/Z                 | 51.5              | -5.5             | 46.0              | 74             | 28.0           | 195         | 45        |
| 19462.59    | H/Y                 | 56.8              | -10.7            | 46.1              | 74             | 27.9           | 159         | 283       |

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 41 von 65  
Page 41 of 65**Table 22: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4879.801    | H/X                 | 43.5              | -6.9             | 36.6              | 54             | 17.4           | 100         | 239       |
| 4920.547    | H/X                 | 41.6              | -6.7             | 34.9              | 54             | 19.1           | 179         | 137       |
| 4879.853    | V/X                 | 45.7              | -6.9             | 38.8              | 54             | 15.2           | 130         | 324       |
| 7295.944    | V/X                 | 40.2              | 0.3              | 40.5              | 54             | 13.5           | 193         | 98        |
| 7320.311    | V/X                 | 41.6              | 0.2              | 41.8              | 54             | 12.2           | 175         | 49        |
| 7296.105    | H/X                 | 40.2              | 0.3              | 40.5              | 54             | 13.5           | 152         | 205       |
| 12200.88    | H/Z                 | 38.1              | -5.5             | 32.6              | 54             | 21.4           | 195         | 45        |
| 19462.59    | H/Y                 | 41.7              | -10.7            | 31.0              | 54             | 23.0           | 159         | 283       |

**Table 23: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4959.860    | H/X                 | 56.2              | -6.5             | 49.7              | 74             | 24.3           | 197         | 43        |
| 4959.889    | H/X                 | 56.6              | -6.5             | 50.0              | 74             | 24.0           | 109         | 203       |
| 4959.834    | V/X                 | 57.1              | -6.5             | 50.6              | 74             | 23.4           | 104         | 48        |
| 7439.399    | V/X                 | 55.4              | -0.3             | 55.1              | 74             | 18.9           | 130         | 31        |
| 7439.325    | V/X                 | 54.9              | -0.3             | 54.6              | 74             | 19.4           | 100         | 184       |
| 7439.268    | H/X                 | 54.7              | -0.3             | 54.4              | 74             | 19.6           | 100         | 112       |
| 12401.02    | V/Z                 | 51.8              | -7.2             | 44.6              | 74             | 29.4           | 195         | 169       |
| 19847.09    | H/Y                 | 56.0              | -10.3            | 45.7              | 74             | 28.3           | 129         | 185       |

**Table 24: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4959.860    | H/X                 | 44.8              | -6.5             | 38.3              | 54             | 15.7           | 197         | 43        |
| 4959.889    | H/X                 | 43.8              | -6.5             | 37.3              | 54             | 16.7           | 109         | 203       |
| 4959.834    | V/X                 | 45.9              | -6.5             | 39.4              | 54             | 14.6           | 104         | 48        |
| 7439.399    | V/X                 | 42.2              | -0.3             | 41.9              | 54             | 12.1           | 130         | 31        |
| 7439.325    | V/X                 | 41.4              | -0.3             | 41.1              | 54             | 12.9           | 100         | 184       |
| 7439.268    | H/X                 | 41.5              | -0.3             | 41.2              | 54             | 12.8           | 100         | 112       |
| 12401.02    | V/Z                 | 37.1              | -7.2             | 29.9              | 54             | 24.1           | 195         | 169       |
| 19847.09    | H/Y                 | 41.3              | -10.3            | 31.0              | 54             | 23.0           | 129         | 185       |

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 42 von 65  
Page 42 of 65**Table 25: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4804.091    | H/X                 | 57.0              | -7.2             | 49.8              | 74             | 24.2           | 197         | 18        |
| 4803.648    | V/X                 | 57.7              | -7.2             | 50.5              | 74             | 23.5           | 130         | 17        |
| 7204.655    | V/X                 | 55.7              | -0.1             | 55.6              | 74             | 18.4           | 152         | 43        |
| 7204.683    | H/X                 | 54.7              | -0.1             | 54.6              | 74             | 19.4           | 157         | 283       |
| 7930.300    | H/X                 | 54.9              | 0.8              | 55.7              | 74             | 18.3           | 104         | 81        |
| 8005.679    | V/Z                 | 56.2              | 0.0              | 56.2              | 74             | 17.8           | 122         | 10        |
| 12012.02    | H/Z                 | 50.2              | -5.2             | 45.0              | 74             | 29.0           | 155         | 246       |
| 19247.70    | V/Y                 | 56.1              | -10.9            | 45.2              | 74             | 28.8           | 146         | 153       |

**Table 26: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4804.091    | H/X                 | 44.7              | -7.2             | 37.5              | 54             | 16.5           | 197         | 18        |
| 4803.648    | V/X                 | 45.6              | -7.2             | 38.4              | 54             | 15.6           | 130         | 17        |
| 7204.655    | V/X                 | 41.4              | -0.1             | 41.3              | 54             | 12.7           | 152         | 43        |
| 7204.683    | H/X                 | 40.6              | -0.1             | 40.5              | 54             | 13.5           | 157         | 283       |
| 7930.300    | H/X                 | 40.9              | 0.8              | 41.7              | 54             | 12.3           | 104         | 81        |
| 8005.679    | V/Z                 | 42.1              | 0.0              | 42.1              | 54             | 11.9           | 122         | 10        |
| 12012.02    | H/Z                 | 36.1              | -5.2             | 30.9              | 54             | 23.1           | 155         | 246       |
| 19247.70    | V/Y                 | 41.5              | -10.9            | 30.6              | 54             | 23.4           | 146         | 153       |

**Table 27: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4879.489    | H/X                 | 56.9              | -6.9             | 50.0              | 74             | 24.0           | 171         | 16        |
| 4879.369    | H/X                 | 56.6              | -6.9             | 49.6              | 74             | 24.4           | 113         | 123       |
| 4879.378    | V/X                 | 57.5              | -6.9             | 50.5              | 74             | 23.5           | 183         | 57        |
| 7318.611    | H/X                 | 55.7              | 0.3              | 56.0              | 74             | 18.0           | 121         | 31        |
| 7204.573    | V/X                 | 56.0              | -0.1             | 55.9              | 74             | 18.1           | 135         | 290       |
| 7203.521    | V/X                 | 54.3              | -0.1             | 54.2              | 74             | 19.8           | 168         | 157       |
| 12201.99    | H/Z                 | 50.6              | -5.5             | 45.1              | 74             | 28.9           | 107         | 147       |
| 19510.83    | H/Y                 | 55.4              | -10.6            | 44.8              | 74             | 29.2           | 142         | 141       |

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 43 von 65  
Page 43 of 65**Table 28: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4879.489    | H/X                 | 44.4              | -6.9             | 37.5              | 54             | 16.5           | 171         | 16        |
| 4879.369    | H/X                 | 43.5              | -6.9             | 36.6              | 54             | 17.4           | 113         | 123       |
| 4879.378    | V/X                 | 44.8              | -6.9             | 37.9              | 54             | 16.1           | 183         | 57        |
| 7318.611    | H/X                 | 42.9              | 0.3              | 43.2              | 54             | 10.8           | 121         | 31        |
| 7204.573    | V/X                 | 40.4              | -0.1             | 40.3              | 54             | 13.7           | 135         | 290       |
| 7203.521    | V/X                 | 40.4              | -0.1             | 40.3              | 54             | 13.7           | 168         | 157       |
| 12201.99    | H/Z                 | 35.9              | -5.5             | 30.4              | 54             | 23.6           | 107         | 147       |
| 19510.83    | H/Y                 | 41.2              | -10.6            | 30.6              | 54             | 23.4           | 142         | 141       |

**Table 29: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4960.440    | V/X                 | 57.7              | -6.5             | 51.2              | 74             | 22.8           | 164         | 339       |
| 4960.563    | H/X                 | 57.7              | -6.5             | 51.2              | 74             | 22.8           | 139         | 166       |
| 7441.116    | H/X                 | 54.9              | -0.3             | 54.6              | 74             | 19.4           | 185         | 173       |
| 7441.009    | H/X                 | 54.7              | -0.3             | 54.4              | 74             | 19.6           | 164         | 171       |
| 7204.091    | V/X                 | 54.6              | -0.1             | 54.5              | 74             | 19.5           | 169         | 320       |
| 7199.600    | H/X                 | 54.4              | -0.1             | 54.1              | 74             | 19.9           | 143         | 68        |
| 12402.04    | V/Z                 | 51.1              | -7.2             | 43.9              | 74             | 30.1           | 183         | 342       |
| 19903.35    | H/Y                 | 55.7              | -10.2            | 45.5              | 74             | 28.5           | 100         | 307       |

**Table 30: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4960.440    | V/X                 | 44.6              | -6.5             | 38.1              | 54             | 15.9           | 164         | 339       |
| 4960.563    | H/X                 | 44.3              | -6.5             | 37.8              | 54             | 16.2           | 139         | 166       |
| 7441.116    | H/X                 | 41.8              | -0.3             | 41.5              | 54             | 12.5           | 185         | 173       |
| 7441.009    | H/X                 | 42.4              | -0.3             | 42.1              | 54             | 11.9           | 164         | 171       |
| 7204.091    | V/X                 | 40.4              | -0.1             | 40.3              | 54             | 13.7           | 169         | 320       |
| 7199.600    | H/X                 | 40.3              | -0.1             | 40.2              | 54             | 13.8           | 143         | 68        |
| 12402.04    | V/Z                 | 36.8              | -7.2             | 29.6              | 54             | 24.4           | 183         | 342       |
| 19903.35    | H/Y                 | 40.6              | -10.2            | 30.4              | 54             | 23.6           | 100         | 307       |

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 44 von 65  
Page 44 of 65**Table 31: [Model A] Band Edge, Modes A (2402MHz) and C (2480MHz), -20dB Limit to Peak Power, 1Mbps, X axis**

| Operating Frequency [MHz] | Fundamental Level [dBm] | Band Edge Limit [dBm] | Band Edge Frequency [MHz] | Band Edge Level [dBm] | Margin [dB] |
|---------------------------|-------------------------|-----------------------|---------------------------|-----------------------|-------------|
| 2402                      | -5.3                    | -25.3                 | 2400.0                    | -56.8                 | 31.6        |
| 2480                      | -2.5                    | -22.5                 | 2483.5                    | -57.9                 | 35.4        |

**Table 32: [Model A] Band Edge, Modes A (2402MHz) and C (2480MHz), Restricted Band, 1Mbps, X axis**

| Operating Frequency [MHz] | Band Edge Frequency [MHz] | Average Limit [dBuV/m] | Peak Limit [dBuV/m] | Average Level [dBuV/m] | Peak Level [dBuV/m] | Average Margin [dB] | Peak Margin [dB] |
|---------------------------|---------------------------|------------------------|---------------------|------------------------|---------------------|---------------------|------------------|
| 2402                      | 2390.0                    | 54                     | 74                  | 46.2                   | 56.7                | 7.8                 | 17.3             |
| 2480                      | 2483.5                    | 54                     | 74                  | 47.3                   | 58.5                | 6.7                 | 15.5             |

**Table 33: [Model A] Band Edge, Modes A (2402MHz) and C (2480MHz), -20dB Limit to Peak Power, 2Mbps, X axis**

| Operating Frequency [MHz] | Fundamental Level [dBm] | Band Edge Limit [dBm] | Band Edge Frequency [MHz] | Band Edge Level [dBm] | Margin [dB] |
|---------------------------|-------------------------|-----------------------|---------------------------|-----------------------|-------------|
| 2402                      | -4.7                    | -24.7                 | 2400.0                    | -36.6                 | 11.9        |
| 2480                      | -6.8                    | -26.8                 | 2483.5                    | -58.2                 | 31.4        |

**Table 34: [Model A] Band Edge, Modes A (2402MHz) and C (2480MHz), Restricted Band, 2Mbps, X axis**

| Operating Frequency [MHz] | Band Edge Frequency [MHz] | Average Limit [dBuV/m] | Peak Limit [dBuV/m] | Average Level [dBuV/m] | Peak Level [dBuV/m] | Average Margin [dB] | Peak Margin [dB] |
|---------------------------|---------------------------|------------------------|---------------------|------------------------|---------------------|---------------------|------------------|
| 2402                      | 2390.0                    | 54                     | 74                  | 46.1                   | 56.6                | 7.9                 | 17.4             |
| 2480                      | 2483.5                    | 54                     | 74                  | 50.8                   | 60.5                | (*) 3.2             | 13.5             |

Notes:

(\*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Figure 14: Radiated Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 1Mbps

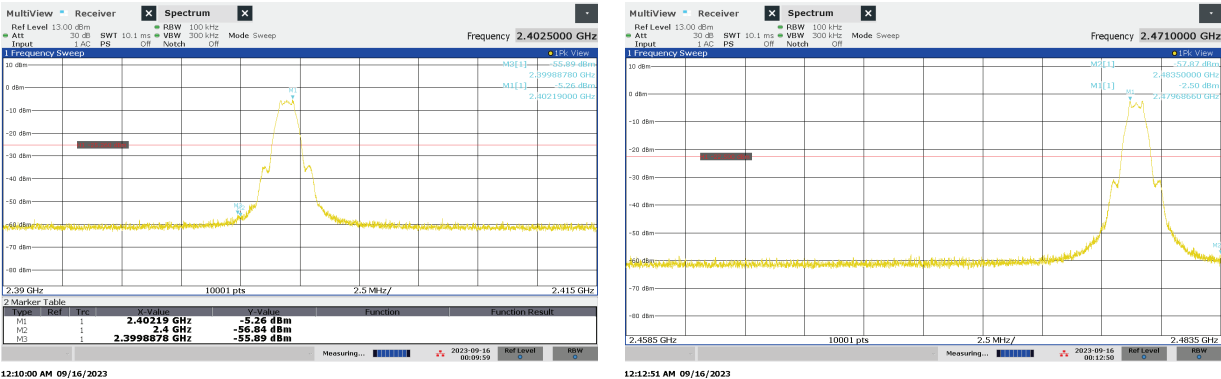
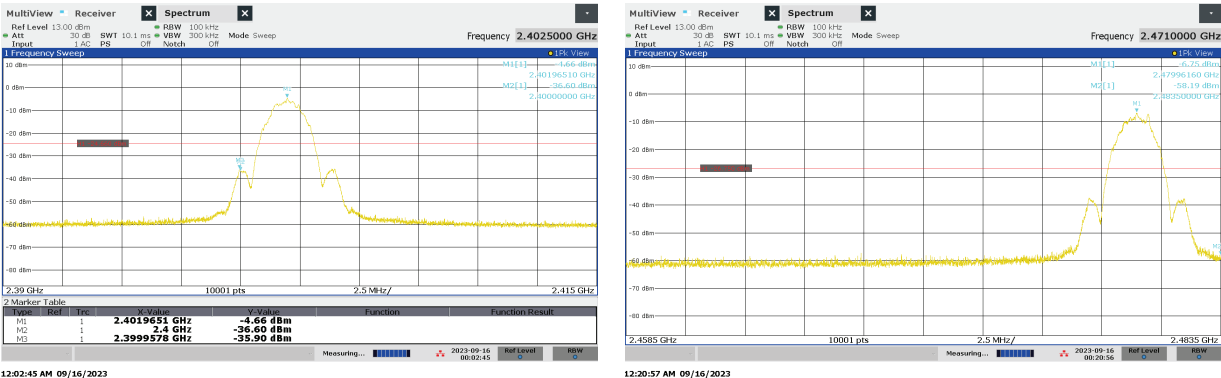


Figure 15: Radiated Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 2Mbps



Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 46 von 65  
Page 46 of 65**Table 35: [Model B] Radiated Emissions, Quasi Peak Data, 9kHz - 30MHz, Mode B (2440MHz), 2Mbps, Z axis**

| Freq. [MHz] | Reading QP [dBμV] | Factor [dB(1/m)] | Level QP [dBμV/m] | Limit [dBμV/m] | Margin QP [dB] | Angle [°] |
|-------------|-------------------|------------------|-------------------|----------------|----------------|-----------|
| 1.612       | 5.8               | 19.3             | 25.1              | 63.4           | 38.3           | 206       |

**Table 36: [Model B] Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 1Mbps, X axis**

| Freq. [MHz] | Antenna Orientation | Reading QP [dBμV] | Factor [dB(1/m)] | Level QP [dBμV/m] | Limit [dBμV/m] | Margin QP [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 47.671      | V                   | 52.7              | -20.7            | 32.0              | 40             | 8.0            | 100         | 356       |
| 62.568      | V                   | 52.4              | -21.6            | 30.8              | 40             | 9.2            | 100         | 74        |
| 65.547      | V                   | 52.5              | -21.9            | 30.6              | 40             | 9.4            | 100         | 6         |
| 65.553      | H                   | 39.2              | -21.9            | 17.3              | 40             | 22.7           | 100         | 162       |
| 68.528      | V                   | 52.5              | -22.3            | 30.2              | 40             | 9.8            | 100         | 30        |
| 71.506      | H                   | 45.6              | -22.9            | 22.7              | 40             | 17.3           | 100         | 143       |
| 71.506      | V                   | 59.0              | -22.9            | 36.1              | 40             | (*) 3.9        | 100         | 162       |
| 74.487      | V                   | 56.3              | -23.6            | 32.7              | 40             | 7.3            | 100         | 62        |

Note:

(\*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 47 von 65  
Page 47 of 65**Table 37: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4803.849    | V/Z                 | 56.0              | -7.2             | 48.8              | 74             | 25.2           | 198         | 113       |
| 4803.853    | H/Z                 | 57.7              | -7.2             | 50.5              | 74             | 23.5           | 113         | 335       |
| 7205.335    | H/Z                 | 55.6              | -0.1             | 55.5              | 74             | 18.5           | 183         | 356       |
| 7205.800    | V/Z                 | 56.9              | -0.1             | 56.8              | 74             | 17.2           | 195         | 26        |
| 7311.176    | V/Z                 | 55.2              | 0.3              | 55.5              | 74             | 18.5           | 197         | 11        |
| 7867.684    | H/Z                 | 53.3              | 0.6              | 54.0              | 74             | 20.0           | 186         | 123       |
| 14410.55    | V/Z                 | 51.5              | -6.8             | 44.7              | 74             | 29.3           | 184         | 112       |
| 19258.78    | H/Z                 | 56.7              | -10.9            | 45.8              | 74             | 28.2           | 120         | 316       |

**Table 38: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4803.849    | V/Z                 | 46.2              | -7.2             | 39.0              | 54             | 15.0           | 198         | 113       |
| 4803.853    | H/Z                 | 50.3              | -7.2             | 43.1              | 54             | 10.9           | 113         | 335       |
| 7205.335    | H/Z                 | 43.1              | -0.1             | 43.0              | 54             | 11.0           | 183         | 356       |
| 7205.800    | V/Z                 | 45.6              | -0.1             | 45.5              | 54             | 8.5            | 195         | 26        |
| 7311.176    | V/Z                 | 40.4              | 0.3              | 40.7              | 54             | 13.3           | 197         | 11        |
| 7867.684    | H/Z                 | 39.1              | 0.6              | 39.7              | 54             | 14.3           | 186         | 123       |
| 14410.55    | V/Z                 | 36.7              | -6.8             | 29.9              | 54             | 24.1           | 184         | 112       |
| 19258.78    | H/Z                 | 41.8              | -10.9            | 30.9              | 54             | 23.1           | 120         | 316       |

**Table 39: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4859.970    | H/Z                 | 55.1              | -7.0             | 48.0              | 74             | 26.0           | 197         | 130       |
| 4860.370    | V/Z                 | 55.0              | -7.0             | 48.0              | 74             | 26.0           | 135         | 114       |
| 6679.990    | V/Z                 | 55.4              | -1.9             | 53.6              | 74             | 20.4           | 198         | 242       |
| 7311.120    | H/Z                 | 55.4              | 0.3              | 55.7              | 74             | 18.3           | 118         | 227       |
| 7311.306    | H/Z                 | 54.7              | 0.3              | 54.9              | 74             | 19.1           | 164         | 250       |
| 7311.979    | V/Z                 | 54.7              | 0.3              | 55.0              | 74             | 19.0           | 196         | 201       |
| 14641.32    | V/Z                 | 50.9              | -6.2             | 44.7              | 74             | 29.3           | 181         | 359       |
| 19514.07    | H/Z                 | 56.7              | -10.6            | 46.1              | 74             | 27.9           | 109         | 137       |

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 48 von 65  
Page 48 of 65**Table 40: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4859.970    | H/Z                 | 40.7              | -7.0             | 33.7              | 54             | 20.3           | 197         | 130       |
| 4860.370    | V/Z                 | 40.7              | -7.0             | 33.7              | 54             | 20.3           | 135         | 114       |
| 6679.990    | V/Z                 | 41.3              | -1.9             | 39.4              | 54             | 14.6           | 198         | 242       |
| 7311.120    | H/Z                 | 40.5              | 0.3              | 40.8              | 54             | 13.2           | 118         | 227       |
| 7311.306    | H/Z                 | 40.5              | 0.3              | 40.8              | 54             | 13.2           | 164         | 250       |
| 7311.979    | V/Z                 | 40.6              | 0.3              | 40.9              | 54             | 13.1           | 196         | 201       |
| 14641.32    | V/Z                 | 36.6              | -6.2             | 30.4              | 54             | 23.6           | 181         | 359       |
| 19514.07    | H/Z                 | 41.8              | -10.6            | 31.2              | 54             | 22.8           | 109         | 137       |

**Table 41: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4959.874    | H/Z                 | 56.7              | -6.5             | 50.2              | 74             | 23.8           | 113         | 158       |
| 4959.859    | V/Z                 | 56.6              | -6.5             | 50.1              | 74             | 23.9           | 179         | 133       |
| 7205.908    | V/Z                 | 54.5              | -0.1             | 54.5              | 74             | 19.5           | 179         | 16        |
| 7311.920    | H/Z                 | 54.4              | 0.3              | 54.7              | 74             | 19.3           | 113         | 76        |
| 7440.089    | H/Z                 | 55.9              | -0.3             | 55.6              | 74             | 18.4           | 100         | 340       |
| 7440.247    | V/Z                 | 55.5              | -0.3             | 55.2              | 74             | 18.8           | 179         | 27        |
| 12397.37    | H/Z                 | 52.0              | -7.2             | 44.8              | 74             | 29.2           | 122         | 265       |
| 19790.80    | H/Z                 | 55.6              | -10.3            | 45.3              | 74             | 28.7           | 149         | 303       |

**Table 42: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 1Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4959.874    | H/Z                 | 45.8              | -6.5             | 39.3              | 54             | 14.7           | 113         | 158       |
| 4959.859    | V/Z                 | 46.6              | -6.5             | 40.1              | 54             | 13.9           | 179         | 133       |
| 7205.908    | V/Z                 | 40.4              | -0.1             | 40.3              | 54             | 13.7           | 179         | 16        |
| 7311.920    | H/Z                 | 40.3              | 0.3              | 40.6              | 54             | 13.4           | 113         | 76        |
| 7440.089    | H/Z                 | 43.8              | -0.3             | 43.5              | 54             | 10.5           | 100         | 340       |
| 7440.247    | V/Z                 | 42.8              | -0.3             | 42.5              | 54             | 11.5           | 179         | 27        |
| 12397.37    | H/Z                 | 37.1              | -7.2             | 29.9              | 54             | 24.1           | 122         | 265       |
| 19790.80    | H/Z                 | 40.8              | -10.3            | 30.5              | 54             | 23.5           | 149         | 303       |

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 49 von 65  
Page 49 of 65**Table 43: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4803.975    | H/Z                 | 58.0              | -7.2             | 50.8              | 74             | 23.2           | 121         | 326       |
| 4804.396    | V/Z                 | 55.3              | -7.2             | 48.1              | 74             | 25.9           | 200         | 131       |
| 7204.575    | H/Z                 | 55.0              | -0.1             | 54.9              | 74             | 19.1           | 157         | 70        |
| 7206.939    | V/Z                 | 54.6              | -0.1             | 54.5              | 74             | 19.5           | 100         | 273       |
| 7206.994    | V/Z                 | 56.8              | -0.1             | 56.7              | 74             | 17.3           | 194         | 28        |
| 7309.758    | H/Z                 | 55.1              | 0.3              | 55.4              | 74             | 18.6           | 157         | 123       |
| 12012.03    | V/Z                 | 50.5              | -5.2             | 45.3              | 74             | 28.7           | 107         | 64        |
| 19471.13    | H/Z                 | 56.0              | -10.7            | 45.3              | 74             | 28.7           | 180         | 305       |

**Table 44: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4803.975    | H/Z                 | 47.5              | -7.2             | 40.3              | 54             | 13.7           | 121         | 326       |
| 4804.396    | V/Z                 | 41.8              | -7.2             | 34.6              | 54             | 19.4           | 200         | 131       |
| 7204.575    | H/Z                 | 40.5              | -0.1             | 40.4              | 54             | 13.6           | 157         | 70        |
| 7206.939    | V/Z                 | 40.8              | -0.1             | 40.7              | 54             | 13.3           | 100         | 273       |
| 7206.994    | V/Z                 | 44.8              | -0.1             | 44.7              | 54             | 9.3            | 194         | 28        |
| 7309.758    | H/Z                 | 40.4              | 0.3              | 40.7              | 54             | 13.3           | 157         | 123       |
| 12012.03    | V/Z                 | 36.0              | -5.2             | 30.8              | 54             | 23.2           | 107         | 64        |
| 19471.13    | H/Z                 | 41.4              | -10.7            | 30.7              | 54             | 23.3           | 180         | 305       |

**Table 45: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4880.180    | V/Z                 | 57.0              | -6.9             | 50.1              | 74             | 23.9           | 171         | 116       |
| 4880.294    | H/Z                 | 56.4              | -6.9             | 49.5              | 74             | 24.5           | 100         | 323       |
| 7321.015    | H/Z                 | 56.7              | 0.2              | 57.0              | 74             | 17.0           | 100         | 341       |
| 7321.013    | V/Z                 | 56.9              | 0.2              | 57.1              | 74             | 16.9           | 171         | 147       |
| 6864.826    | H/Z                 | 55.9              | -1.4             | 54.5              | 74             | 19.5           | 164         | 152       |
| 6850.046    | V/Z                 | 55.2              | -1.4             | 53.8              | 74             | 20.2           | 135         | 321       |
| 12206.64    | V/Z                 | 51.1              | -5.5             | 45.6              | 74             | 28.4           | 183         | 298       |
| 19471.13    | H/Z                 | 56.0              | -10.7            | 45.3              | 74             | 28.7           | 180         | 305       |

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 50 von 65  
Page 50 of 65**Table 46: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4880.180    | V/Z                 | 45.5              | -6.9             | 38.6              | 54             | 15.4           | 171         | 116       |
| 4880.294    | H/Z                 | 44.5              | -6.9             | 37.6              | 54             | 16.4           | 100         | 323       |
| 7321.015    | H/Z                 | 43.7              | 0.2              | 43.9              | 54             | 10.1           | 100         | 341       |
| 7321.013    | V/Z                 | 44.0              | 0.2              | 44.2              | 54             | 9.8            | 171         | 147       |
| 6864.826    | H/Z                 | 41.0              | -1.4             | 39.6              | 54             | 14.4           | 164         | 152       |
| 6850.046    | V/Z                 | 40.9              | -1.4             | 39.5              | 54             | 14.5           | 135         | 321       |
| 12206.64    | V/Z                 | 36.2              | -5.5             | 30.7              | 54             | 23.3           | 183         | 298       |
| 19471.13    | H/Z                 | 41.4              | -10.7            | 30.7              | 54             | 23.3           | 180         | 305       |

**Table 47: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading PK [dBμV] | Factor [dB(1/m)] | Level PK [dBμV/m] | Limit [dBμV/m] | Margin PK [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4959.337    | H/Z                 | 57.4              | -6.5             | 50.9              | 74             | 23.1           | 100         | 348       |
| 4959.635    | V/Z                 | 60.2              | -6.5             | 53.7              | 74             | 20.3           | 179         | 28        |
| 7124.210    | H/Z                 | 54.0              | -0.6             | 53.3              | 74             | 20.7           | 179         | 281       |
| 7295.611    | V/Z                 | 54.9              | 0.3              | 55.2              | 74             | 18.8           | 168         | 16        |
| 7438.616    | H/Z                 | 56.3              | -0.3             | 56.0              | 74             | 18.0           | 104         | 294       |
| 7438.540    | V/Z                 | 55.0              | -0.3             | 54.7              | 74             | 19.3           | 130         | 181       |
| 12401.54    | V/Z                 | 51.7              | -7.2             | 44.5              | 74             | 29.5           | 192         | 151       |
| 19902.28    | H/Z                 | 55.4              | -10.2            | 45.2              | 74             | 28.8           | 194         | 261       |

**Table 48: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 2Mbps**

| Freq. [MHz] | ANT/EUT Orientation | Reading AV [dBμV] | Factor [dB(1/m)] | Level AV [dBμV/m] | Limit [dBμV/m] | Margin AV [dB] | Height [cm] | Angle [°] |
|-------------|---------------------|-------------------|------------------|-------------------|----------------|----------------|-------------|-----------|
| 4959.337    | H/Z                 | 45.3              | -6.5             | 38.8              | 54             | 15.2           | 100         | 348       |
| 4959.635    | V/Z                 | 49.8              | -6.5             | 43.3              | 54             | 10.7           | 179         | 28        |
| 7124.210    | H/Z                 | 40.0              | -0.6             | 39.4              | 54             | 14.6           | 179         | 281       |
| 7295.611    | V/Z                 | 40.2              | 0.3              | 40.5              | 54             | 13.5           | 168         | 16        |
| 7438.616    | H/Z                 | 44.7              | -0.3             | 44.4              | 54             | 9.6            | 104         | 294       |
| 7438.540    | V/Z                 | 41.2              | -0.3             | 40.9              | 54             | 13.1           | 130         | 181       |
| 12401.54    | V/Z                 | 37.1              | -7.2             | 29.9              | 54             | 24.1           | 192         | 151       |
| 19902.28    | H/Z                 | 40.9              | -10.2            | 30.7              | 54             | 23.3           | 194         | 261       |

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 51 von 65  
Page 51 of 65**Table 49: [Model B] Band Edge, Modes A (2402MHz) and C (2480MHz), -20dB Limit to Peak Power, 1Mbps, X axis**

| Operating Frequency [MHz] | Fundamental Level [dBm] | Band Edge Limit [dBm] | Band Edge Frequency [MHz] | Band Edge Level [dBm] | Margin [dB] |
|---------------------------|-------------------------|-----------------------|---------------------------|-----------------------|-------------|
| 2402                      | -7.0                    | -27.0                 | 2400.0                    | -57.2                 | 30.2        |
| 2480                      | -3.3                    | -23.3                 | 2483.5                    | -59.9                 | 36.5        |

**Table 50: [Model B] Band Edge, Modes A (2402MHz) and C (2480MHz), Restricted Band, 1Mbps, X axis**

| Operating Frequency [MHz] | Band Edge Frequency [MHz] | Average Limit [dBuV/m] | Peak Limit [dBuV/m] | Average Level [dBuV/m] | Peak Level [dBuV/m] | Average Margin [dB] | Peak Margin [dB] |
|---------------------------|---------------------------|------------------------|---------------------|------------------------|---------------------|---------------------|------------------|
| 2402                      | 2390.0                    | 54                     | 74                  | 46.2                   | 56.9                | 7.8                 | 17.1             |
| 2480                      | 2483.5                    | 54                     | 74                  | 46.8                   | 57.3                | 7.2                 | 16.7             |

**Table 51: [Model B] Band Edge, Modes A (2402MHz) and C (2480MHz), -20dB Limit to Peak Power, 2Mbps, X axis**

| Operating Frequency [MHz] | Fundamental Level [dBm] | Band Edge Limit [dBm] | Band Edge Frequency [MHz] | Band Edge Level [dBm] | Margin [dB] |
|---------------------------|-------------------------|-----------------------|---------------------------|-----------------------|-------------|
| 2402                      | -7.4                    | -27.4                 | 2400.0                    | -38.0                 | 10.5        |
| 2480                      | -7.2                    | -27.2                 | 2483.5                    | -58.5                 | 31.3        |

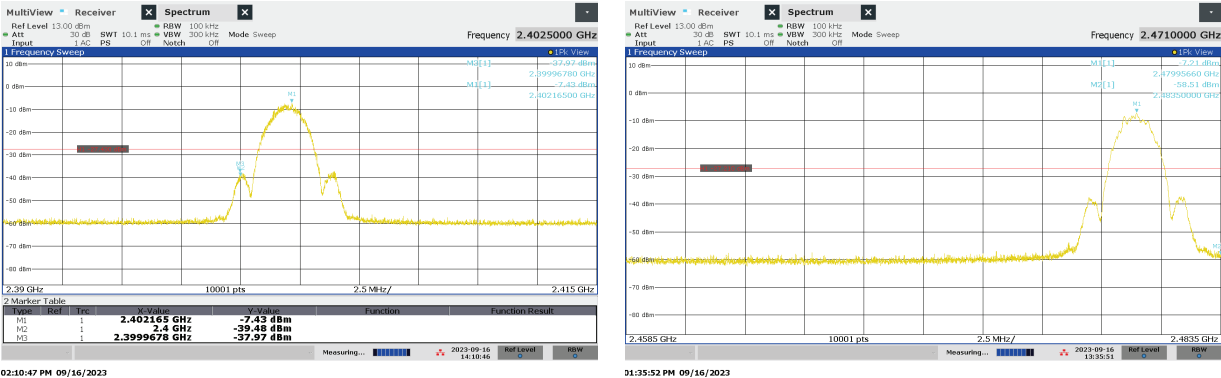
**Table 52: [Model B] Band Edge, Modes A (2402MHz) and C (2480MHz), Restricted Band, 2Mbps, X axis**

| Operating Frequency [MHz] | Band Edge Frequency [MHz] | Average Limit [dBuV/m] | Peak Limit [dBuV/m] | Average Level [dBuV/m] | Peak Level [dBuV/m] | Average Margin [dB] | Peak Margin [dB] |
|---------------------------|---------------------------|------------------------|---------------------|------------------------|---------------------|---------------------|------------------|
| 2402                      | 2390.0                    | 54                     | 74                  | 46.2                   | 56.9                | 7.8                 | 17.1             |
| 2480                      | 2483.5                    | 54                     | 74                  | 48.5                   | 60.0                | 5.5                 | 14.0             |

Figure 16: [Model B] Radiated Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 1Mbps, X axis



Figure 17: [Model B] Radiated Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 2Mbps, X axis



## 5.4 AC Power Line Conducted Measurements

### 5.4.1 AC Power Line Conducted Emission of Transmitter

**RESULT:****PASS**

Date of testing: 2023-09-13

Ambient temperature: 24°C

Relative humidity: 67%

Atmospheric pressure: 1005hPa

Frequency range: 0.15 - 30MHz

Kind of test site: Shielded Room

Operation Modes: B

Configurations: 1M, 2M

Tested Models: Model A

**Requirements:**

FCC 15.207

The AC power line conducted emission on any frequency within the band 150kHz to 30MHz shall not exceed the limits specified in FCC 15.207.

**Test procedure:**

ANSI C63.10 §6.2

The EUT was placed on a wooden table raised 80cm above the reference ground plane. A vertical conducting plane of the screened room was located 40cm to the rear of the EUT. The AC adapter of the EUT was connected to a Line Impedance Stabilization Network (LISN).

The physical arrangement of the test system and associated cabling was varied to determine the effect on the EUT's emissions in amplitude and frequency in order to ensure that maximum emission amplitudes were attained.

The measurements were performed with a test receiver operating in the CISPR quasi-peak and average detection modes. The receiver's 6dB bandwidth was set to 9kHz.

Disturbances other than those mentioned are small or not detectable.

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 54 von 65  
Page 54 of 65**Table 53: AC Power Line Conducted Emission, Quasi Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Mode B (2440MHz), 1Mbps**

| Freq. [MHz] | Phase | Reading QP [dBµV] | Reading AV [dBµV] | Factor [dB] | Level QP [dBµV] | Level AV [dBµV] | Limit QP [dBµV] | Limit AV [dBµV] | Margin QP [dB] | Margin AV [dB] |
|-------------|-------|-------------------|-------------------|-------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|
| 0.254       | N     | 29.8              | 24.1              | 9.8         | 39.6            | 33.9            | 61.6            | 51.6            | 22.0           | 17.7           |
| 0.254       | L1    | 30.9              | 24.7              | 9.8         | 40.7            | 34.5            | 61.6            | 51.6            | 20.9           | 17.1           |
| 0.483       | L1    | 19.8              | 19.5              | 9.8         | 29.6            | 29.3            | 56.3            | 46.3            | 26.7           | 17.0           |
| 0.484       | N     | 23.7              | 23.6              | 9.8         | 33.5            | 33.4            | 56.3            | 46.3            | 22.8           | 12.9           |
| 0.564       | N     | 21.7              | 21.4              | 9.8         | 31.5            | 31.2            | 56.0            | 46.0            | 24.5           | 14.8           |
| 0.886       | N     | 23.6              | 20.5              | 9.7         | 33.3            | 30.2            | 56.0            | 46.0            | 22.7           | 15.8           |
| 1.253       | L1    | 20.4              | 20.2              | 9.8         | 30.2            | 30.0            | 56.0            | 46.0            | 25.8           | 16.0           |
| 2.506       | L1    | 21.8              | 20.3              | 9.8         | 31.6            | 30.1            | 56.0            | 46.0            | 24.4           | 15.9           |
| 4.385       | N     | 23.2              | 22.1              | 9.9         | 33.1            | 32.0            | 56.0            | 46.0            | 22.9           | 14.0           |
| 11.746      | N     | 36.4              | 33.9              | 10.1        | 46.5            | 44.0            | 60.0            | 50.0            | 13.5           | 6.0            |
| 12.217      | L1    | 36.9              | 35.9              | 10.1        | 47.0            | 46.0            | 60.0            | 50.0            | 13.0           | 4.0            |
| 12.843      | L1    | 37.0              | 35.8              | 10.1        | 47.1            | 45.9            | 60.0            | 50.0            | 12.9           | 4.1            |
| 13.156      | L1    | 37.2              | 36.0              | 10.1        | 47.3            | 46.1            | 60.0            | 50.0            | 12.7           | 3.9            |
| 13.783      | L1    | 37.0              | 36.1              | 10.1        | 47.1            | 46.2            | 60.0            | 50.0            | 12.9           | 3.8            |
| 13.783      | L1    | 37.0              | 36.1              | 10.1        | 47.1            | 46.2            | 60.0            | 50.0            | 12.9           | 3.8            |
| 14.096      | N     | 38.0              | 37.5              | 10.1        | 48.1            | 47.6            | 60.0            | 50.0            | 11.9           | (*) 2.4        |
| 14.409      | N     | 38.4              | 37.4              | 10.1        | 48.5            | 47.5            | 60.0            | 50.0            | 11.5           | (*) 2.5        |
| 14.409      | N     | 38.4              | 37.4              | 10.1        | 48.5            | 47.5            | 60.0            | 50.0            | 11.5           | (*) 2.5        |
| 15.035      | N     | 37.4              | 36.3              | 10.1        | 47.5            | 46.4            | 60.0            | 50.0            | 12.5           | 3.6            |
| 23.839      | N     | 31.0              | 25.3              | 10.3        | 41.3            | 35.6            | 60.0            | 50.0            | 18.7           | 14.4           |
| 28.561      | N     | 36.8              | 29.5              | 10.4        | 47.2            | 39.9            | 60.0            | 50.0            | 12.8           | 10.1           |
| 28.600      | L1    | 35.9              | 28.2              | 10.3        | 46.2            | 38.5            | 60.0            | 50.0            | 13.8           | 11.5           |
| 0.254       | N     | 29.8              | 24.1              | 9.8         | 39.6            | 33.9            | 61.6            | 51.6            | 22.0           | 17.7           |
| 0.254       | L1    | 30.9              | 24.7              | 9.8         | 40.7            | 34.5            | 61.6            | 51.6            | 20.9           | 17.1           |
| 0.483       | L1    | 19.8              | 19.5              | 9.8         | 29.6            | 29.3            | 56.3            | 46.3            | 26.7           | 17.0           |
| 0.484       | N     | 23.7              | 23.6              | 9.8         | 33.5            | 33.4            | 56.3            | 46.3            | 22.8           | 12.9           |

Note: Level QP = Reading QP + Factor, Level AV = Reading AV + Factor

(\*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Prüfbericht-Nr.:  
Test Report No.:**JP232NN1 001**Seite 55 von 65  
Page 55 of 65**Table 54: AC Power Line Conducted Emission, Quasi Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Mode B (2440MHz), 2Mbps**

| Freq. [MHz] | Phase | Reading QP [dBµV] | Reading AV [dBµV] | Factor [dB] | Level QP [dBµV] | Level AV [dBµV] | Limit QP [dBµV] | Limit AV [dBµV] | Margin QP [dB] | Margin AV [dB] |
|-------------|-------|-------------------|-------------------|-------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|
| 0.254       | N     | 29.9              | 24.3              | 9.8         | 39.7            | 34.1            | 61.6            | 51.6            | 21.9           | 17.5           |
| 0.254       | L1    | 30.9              | 24.6              | 9.8         | 40.7            | 34.4            | 61.6            | 51.6            | 20.9           | 17.2           |
| 0.254       | L1    | 31.0              | 24.8              | 9.8         | 40.8            | 34.6            | 61.6            | 51.6            | 20.8           | 17.0           |
| 0.483       | L1    | 19.7              | 19.3              | 9.8         | 29.5            | 29.1            | 56.3            | 46.3            | 26.8           | 17.2           |
| 0.484       | N     | 23.7              | 23.6              | 9.8         | 33.5            | 33.4            | 56.3            | 46.3            | 22.8           | 12.9           |
| 0.564       | N     | 21.8              | 21.5              | 9.8         | 31.6            | 31.3            | 56.0            | 46.0            | 24.4           | 14.7           |
| 0.806       | N     | 23.1              | 22.9              | 9.7         | 32.8            | 32.6            | 56.0            | 46.0            | 23.2           | 13.4           |
| 2.193       | L1    | 21.2              | 19.9              | 9.8         | 31.0            | 29.7            | 56.0            | 46.0            | 25.0           | 16.3           |
| 2.506       | L1    | 21.6              | 20.2              | 9.8         | 31.4            | 30.0            | 56.0            | 46.0            | 24.6           | 16.0           |
| 11.590      | L1    | 35.5              | 33.9              | 10.1        | 45.6            | 44.0            | 60.0            | 50.0            | 14.4           | 6.0            |
| 12.843      | L1    | 36.8              | 35.7              | 10.1        | 46.9            | 45.8            | 60.0            | 50.0            | 13.1           | 4.2            |
| 13.156      | N     | 37.1              | 36.0              | 10.1        | 47.2            | 46.1            | 60.0            | 50.0            | 12.8           | 3.9            |
| 13.470      | L1    | 36.7              | 36.1              | 10.1        | 46.8            | 46.2            | 60.0            | 50.0            | 13.2           | 3.8            |
| 13.783      | N     | 38.1              | 37.3              | 10.1        | 48.2            | 47.4            | 60.0            | 50.0            | 11.8           | (*) 2.6        |
| 13.783      | N     | 38.1              | 37.4              | 10.1        | 48.2            | 47.5            | 60.0            | 50.0            | 11.8           | (*) 2.5        |
| 13.783      | L1    | 37.0              | 36.1              | 10.1        | 47.1            | 46.2            | 60.0            | 50.0            | 12.9           | 3.8            |
| 14.096      | N     | 38.0              | 37.5              | 10.1        | 48.1            | 47.6            | 60.0            | 50.0            | 11.9           | (*) 2.4        |
| 14.409      | N     | 38.4              | 37.4              | 10.1        | 48.5            | 47.5            | 60.0            | 50.0            | 11.5           | (*) 2.5        |
| 15.036      | L1    | 36.1              | 34.4              | 10.1        | 46.2            | 44.5            | 60.0            | 50.0            | 13.8           | 5.5            |
| 15.036      | N     | 37.6              | 36.4              | 10.1        | 47.7            | 46.5            | 60.0            | 50.0            | 12.3           | 3.5            |
| 17.385      | L1    | 34.2              | 33.2              | 10.2        | 44.4            | 43.4            | 60.0            | 50.0            | 15.6           | 6.6            |
| 20.480      | L1    | 33.0              | 28.6              | 10.2        | 43.2            | 38.8            | 60.0            | 50.0            | 16.8           | 11.2           |
| 23.854      | L1    | 30.1              | 24.4              | 10.2        | 40.3            | 34.6            | 60.0            | 50.0            | 19.7           | 15.4           |
| 26.641      | N     | 34.5              | 28.0              | 10.3        | 44.8            | 38.3            | 60.0            | 50.0            | 15.2           | 11.7           |
| 28.480      | L1    | 36.2              | 29.7              | 10.3        | 46.5            | 40.0            | 60.0            | 50.0            | 13.5           | 10.0           |
| 28.520      | N     | 37.0              | 30.2              | 10.4        | 47.4            | 40.6            | 60.0            | 50.0            | 12.6           | 9.4            |

Note: Level QP = Reading QP + Factor, Level AV = Reading AV + Factor

(\*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

## 8. List of Tables

|                                                                                                                                                              |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 1: Test Summary.....                                                                                                                                   | 5  |
| Table 2: List of Test and Measurement Equipment.....                                                                                                         | 7  |
| Table 3: Emission Measurement Uncertainty.....                                                                                                               | 9  |
| Table 4: Interfaces present on the EUT.....                                                                                                                  | 13 |
| Table 5: Maximum Peak Output Power, 1Mbps.....                                                                                                               | 18 |
| Table 6: Maximum Peak Output Power, 2Mbps.....                                                                                                               | 18 |
| Table 7: 6dB Bandwidth, 1Mbps.....                                                                                                                           | 21 |
| Table 8: 6dB Bandwidth, 2Mbps.....                                                                                                                           | 21 |
| Table 9: 99% Bandwidth and Edge Frequencies, 1Mbps.....                                                                                                      | 25 |
| Table 10: 99% Bandwidth and Edge Frequencies, 2Mbps.....                                                                                                     | 25 |
| Table 11: Conducted Spurious Emissions, 30MHz – 25GHz, -20dB Limit to Peak Power, 1Mbps.....                                                                 | 29 |
| Table 12: Conducted Spurious Emissions, 30MHz – 25GHz, -20dB Limit to Peak Power, 2Mbps.....                                                                 | 29 |
| Table 13: Conducted Spurious Emissions, Band Edge, -20dB Limit to Peak Power, 1Mbps.....                                                                     | 29 |
| Table 14: Conducted Spurious Emissions, Band Edge, -20dB Limit to Peak Power, 2Mbps.....                                                                     | 29 |
| Table 15: Peak Power Spectral Density.....                                                                                                                   | 34 |
| Table 16: Peak Power Spectral Density.....                                                                                                                   | 34 |
| Table 17: [Model A] Radiated Emissions, Quasi Peak Data, 9kHz - 30MHz, Mode B (2440MHz),<br>1Mbps, X axis.....                                               | 39 |
| Table 18: [Model A] Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical<br>Antenna Orientations, Mode B (2440MHz), 2Mbps, X axis..... | 39 |
| Table 19: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode A (2402MHz), 1Mbps.....                  | 40 |
| Table 20: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode A (2402MHz), 1Mbps.....               | 40 |
| Table 21: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode B (2440MHz), 1Mbps.....                  | 40 |
| Table 22: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode B (2440MHz), 1Mbps.....               | 41 |
| Table 23: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode C (2480MHz), 1Mbps.....                  | 41 |
| Table 24: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode C (2480MHz), 1Mbps.....               | 41 |
| Table 25: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode A (2402MHz), 2Mbps.....                  | 42 |
| Table 26: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode A (2402MHz), 2Mbps.....               | 42 |
| Table 27: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode B (2440MHz), 2Mbps.....                  | 42 |
| Table 28: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode B (2440MHz), 2Mbps.....               | 43 |
| Table 29: [Model A] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode C (2480MHz), 2Mbps.....                  | 43 |
| Table 30: [Model A] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna<br>Orientations, Mode C (2480MHz), 2Mbps.....               | 43 |
| Table 31: [Model A] Band Edge, Modes A (2402MHz) and C (2480MHz), -20dB Limit to Peak Power,<br>1Mbps, X axis.....                                           | 44 |
| Table 32: [Model A] Band Edge, Modes A (2402MHz) and C (2480MHz), Restricted Band, 1Mbps, X<br>axis.....                                                     | 44 |
| Table 33: [Model A] Band Edge, Modes A (2402MHz) and C (2480MHz), -20dB Limit to Peak Power,<br>2Mbps, X axis.....                                           | 44 |
| Table 34: [Model A] Band Edge, Modes A (2402MHz) and C (2480MHz), Restricted Band, 2Mbps, X<br>axis.....                                                     | 44 |
| Table 35: [Model B] Radiated Emissions, Quasi Peak Data, 9kHz - 30MHz, Mode B (2440MHz),<br>2Mbps, Z axis.....                                               | 46 |

|                                                                                                                                                            |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 36: [Model B] Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 1Mbps, X axis ..... | 46 |
| Table 37: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 1Mbps.....                   | 47 |
| Table 38: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 1Mbps.....                | 47 |
| Table 39: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 1Mbps.....                   | 47 |
| Table 40: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 1Mbps.....                | 48 |
| Table 41: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 1Mbps.....                   | 48 |
| Table 42: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 1Mbps.....                | 48 |
| Table 43: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 2Mbps.....                   | 49 |
| Table 44: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode A (2402MHz), 2Mbps.....                | 49 |
| Table 45: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 2Mbps.....                   | 49 |
| Table 46: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode B (2440MHz), 2Mbps.....                | 50 |
| Table 47: [Model B] Radiated Emissions, Peak Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 2Mbps.....                   | 50 |
| Table 48: [Model B] Radiated Emissions, Average Data, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, Mode C (2480MHz), 2Mbps.....                | 50 |
| Table 49: [Model B] Band Edge, Modes A (2402MHz) and C (2480MHz), -20dB Limit to Peak Power, 1Mbps, X axis.....                                            | 51 |
| Table 50: [Model B] Band Edge, Modes A (2402MHz) and C (2480MHz), Restricted Band, 1Mbps, X axis.....                                                      | 51 |
| Table 51: [Model B] Band Edge, Modes A (2402MHz) and C (2480MHz), -20dB Limit to Peak Power, 2Mbps, X axis.....                                            | 51 |
| Table 52: [Model B] Band Edge, Modes A (2402MHz) and C (2480MHz), Restricted Band, 2Mbps, X axis.....                                                      | 51 |
| Table 53: AC Power Line Conducted Emission, Quasi Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Mode B (2440MHz), 1Mbps .....               | 54 |
| Table 54: AC Power Line Conducted Emission, Quasi Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Mode B (2440MHz), 2Mbps .....               | 55 |

## 9. List of Figures

|                                                                                                               |    |
|---------------------------------------------------------------------------------------------------------------|----|
| Figure 1: Block Diagram.....                                                                                  | 13 |
| Figure 2: Maximum Peak Output Power, Mode A ~ C, 1Mbps .....                                                  | 19 |
| Figure 3: Maximum Peak Output Power, Mode A ~ C, 2Mbps .....                                                  | 20 |
| Figure 4: 6dB Bandwidth, Mode A ~ C, 1Mbps .....                                                              | 22 |
| Figure 5: 6dB Bandwidth, Mode A ~ C, 2Mbps .....                                                              | 23 |
| Figure 6: 99% Bandwidth, Mode A ~ C, 1Mbps .....                                                              | 26 |
| Figure 7: 99% Bandwidth, Mode A ~ C, 2Mbps .....                                                              | 27 |
| Figure 8: Conducted Spurious Emissions, 30MHz – 25GHz, Mode A ~ C, 1Mbps.....                                 | 30 |
| Figure 9: Conducted Spurious Emissions, 30MHz – 25GHz, Mode A ~ C, 2Mbps.....                                 | 31 |
| Figure 10: Conducted Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 1Mbps ..... | 32 |

|                                                                                                                               |    |
|-------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 11: Conducted Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 2Mbps .....                 | 32 |
| Figure 12: Power Spectral Density, Mode A ~ C, 1Mbps.....                                                                     | 35 |
| Figure 13: Power Spectral Density, Mode A ~ C, 2Mbps.....                                                                     | 36 |
| Figure 14: Radiated Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 1Mbps .....                  | 45 |
| Figure 15: Radiated Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 2Mbps .....                  | 45 |
| Figure 16: [Model B] Radiated Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 1Mbps, X axis..... | 52 |
| Figure 17: [Model B] Radiated Emissions at Band Edge, Spectral Diagram, Modes A (2402MHz) and C (2480MHz), 2Mbps, X axis..... | 52 |

## 10. List of Photographs

|                                                                                           |    |
|-------------------------------------------------------------------------------------------|----|
| Photograph 1: I/O Board .....                                                             | 14 |
| Photograph 2: EUT, Model A Orientation, X Axis.....                                       | 56 |
| Photograph 3: EUT, Model B Orientation, X Axis.....                                       | 57 |
| Photograph 4: EUT, Model A Orientation, Y Axis.....                                       | 57 |
| Photograph 5: EUT, Model B Orientation, Y Axis.....                                       | 58 |
| Photograph 6: EUT, Model A Orientation, Z Axis .....                                      | 58 |
| Photograph 7: EUT, Model B Orientation, Z Axis .....                                      | 59 |
| Photograph 8: Set-up for Radiated Emission of Transmitter at MHz Range, Front View .....  | 59 |
| Photograph 9: Set-up for Radiated Emission of Transmitter at MHz Range, Rear View.....    | 60 |
| Photograph 10: Set-up for Radiated Emission of Transmitter at GHz Range, Front View ..... | 60 |
| Photograph 11: Set-up for Radiated Emission of Transmitter at GHz Range, Rear View.....   | 61 |
| Photograph 12: Set-up for RF Conducted Test.....                                          | 61 |
| Photograph 13: Set-up for AC Power Line Conducted Emission, Front View.....               | 62 |
| Photograph 14: Set-up for AC Power Line Conducted Emission, Rear View .....               | 62 |

– End of test report –