



# RADIO TEST REPORT

Test Report No.: 14420105H-B-R1

|                     |                               |
|---------------------|-------------------------------|
| Customer            | Sony Group Corporation        |
| Description of EUT  | Digital Wireless Transmitter  |
| Model Number of EUT | DWT-P30                       |
| FCC ID              | AK8DWTP30                     |
| Test Regulation     | FCC Part 15 Subpart C         |
| Test Result         | Complied (Refer to SECTION 3) |
| Issue Date          | November 18, 2022             |
| Remarks             | -                             |

|                                                                                                                                                                            |                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Representative Test Engineer</b>                                                                                                                                        | <b>Approved By</b>                                                                   |
|                                                                                         |  |
| Takumi Nishida<br>Engineer                                                                                                                                                 | Tsubasa Takayama<br>Leader                                                           |
|   |                                                                                      |
| CERTIFICATE 5107.02                                                                                                                                                        |                                                                                      |
| <input type="checkbox"/> The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.                                       |                                                                                      |
| <input checked="" type="checkbox"/> There is no testing item of "Non-accreditation".                                                                                       |                                                                                      |

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 21.0

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- The information provided from the customer for this report is identified in Section 1.
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## **REVISION HISTORY**

### **Original Test Report No.: 14420105H-B**

This report is a revised version of 14420105H-B. 14420105H-B is replaced with this report.

| Revision        | Test Report No. | Date              | Page Revised Contents                                                                                                                                                                                                                                            |
|-----------------|-----------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -<br>(Original) | 14420105H-B     | October 3, 2022   | -                                                                                                                                                                                                                                                                |
| 1               | 14420105H-B-R1  | November 18, 2022 | APPENDIX 3: Photographs of Test Setup Addition of below explanatory note.<br><br>*The model printing of the EUT is different from the application model since this EUT is an engineering prototype.<br>This difference has no effect on the Radio specification. |

## Reference: Abbreviations (Including words undescribed in this report)

|                |                                                                 |         |                                                     |
|----------------|-----------------------------------------------------------------|---------|-----------------------------------------------------|
| A2LA           | The American Association for Laboratory Accreditation           | ICES    | Interference-Causing Equipment Standard             |
| AC             | Alternating Current                                             | IEC     | International Electrotechnical Commission           |
| AFH            | Adaptive Frequency Hopping                                      | IEEE    | Institute of Electrical and Electronics Engineers   |
| AM             | Amplitude Modulation                                            | IF      | Intermediate Frequency                              |
| Amp, AMP       | Amplifier                                                       | ILAC    | International Laboratory Accreditation Conference   |
| ANSI           | American National Standards Institute                           | ISED    | Innovation, Science and Economic Development Canada |
| Ant, ANT       | Antenna                                                         | ISO     | International Organization for Standardization      |
| AP             | Access Point                                                    | JAB     | Japan Accreditation Board                           |
| ASK            | Amplitude Shift Keying                                          | LAN     | Local Area Network                                  |
| Atten., ATT    | Attenuator                                                      | LIMS    | Laboratory Information Management System            |
| AV             | Average                                                         | MCS     | Modulation and Coding Scheme                        |
| BPSK           | Binary Phase-Shift Keying                                       | MRA     | Mutual Recognition Arrangement                      |
| BR             | Bluetooth Basic Rate                                            | N/A     | Not Applicable                                      |
| BT             | Bluetooth                                                       | NIST    | National Institute of Standards and Technology      |
| BT LE          | Bluetooth Low Energy                                            | NS      | No signal detect.                                   |
| BW             | BandWidth                                                       | NSA     | Normalized Site Attenuation                         |
| Cal Int        | Calibration Interval                                            | NVLAP   | National Voluntary Laboratory Accreditation Program |
| CCK            | Complementary Code Keying                                       | OBW     | Occupied Band Width                                 |
| Ch., CH        | Channel                                                         | OFDM    | Orthogonal Frequency Division Multiplexing          |
| CISPR          | Comite International Special des Perturbations Radioelectriques | P/M     | Power meter                                         |
| CW             | Continuous Wave                                                 | PCB     | Printed Circuit Board                               |
| DBPSK          | Differential BPSK                                               | PER     | Packet Error Rate                                   |
| DC             | Direct Current                                                  | PHY     | Physical Layer                                      |
| D-factor       | Distance factor                                                 | PK      | Peak                                                |
| DFS            | Dynamic Frequency Selection                                     | PN      | Pseudo random Noise                                 |
| DQPSK          | Differential QPSK                                               | PRBS    | Pseudo-Random Bit Sequence                          |
| DSSS           | Direct Sequence Spread Spectrum                                 | PSD     | Power Spectral Density                              |
| EDR            | Enhanced Data Rate                                              | QAM     | Quadrature Amplitude Modulation                     |
| EIRP, e.i.r.p. | Equivalent Isotropically Radiated Power                         | QP      | Quasi-Peak                                          |
| EMC            | ElectroMagnetic Compatibility                                   | QPSK    | Quadri-Phase Shift Keying                           |
| EMI            | ElectroMagnetic Interference                                    | RBW     | Resolution Band Width                               |
| EN             | European Norm                                                   | RDS     | Radio Data System                                   |
| ERP, e.r.p.    | Effective Radiated Power                                        | RE      | Radio Equipment                                     |
| EU             | European Union                                                  | RF      | Radio Frequency                                     |
| EUT            | Equipment Under Test                                            | RMS     | Root Mean Square                                    |
| Fac.           | Factor                                                          | RSS     | Radio Standards Specifications                      |
| FCC            | Federal Communications Commission                               | Rx      | Receiving                                           |
| FHSS           | Frequency Hopping Spread Spectrum                               | SA, S/A | Spectrum Analyzer                                   |
| FM             | Frequency Modulation                                            | SG      | Signal Generator                                    |
| Freq.          | Frequency                                                       | SVSWR   | Site-Voltage Standing Wave Ratio                    |
| FSK            | Frequency Shift Keying                                          | TR      | Test Receiver                                       |
| GFSK           | Gaussian Frequency-Shift Keying                                 | Tx      | Transmitting                                        |
| GNSS           | Global Navigation Satellite System                              | VBW     | Video BandWidth                                     |
| GPS            | Global Positioning System                                       | Vert.   | Vertical                                            |
| Hori.          | Horizontal                                                      | WLAN    | Wireless LAN                                        |

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## **SECTION 1: Customer Information**

|                  |                                                  |
|------------------|--------------------------------------------------|
| Company Name     | Sony Group Corporation                           |
| Address          | 8-4, Shiomi Kisarazu-shi, Chiba, 292-0834 Japan. |
| Telephone Number | +81-438-37-4704                                  |
| Contact Person   | Youhei Hisano                                    |

### **\*Remarks**

Sony Global Manufacturing & Operations Corporation (Subsidiary Company Name) is on behalf of the applicant: Sony Group Corporation.

The information provided from the customer is as follows;

- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer Information
- SECTION 2: Equipment Under Test (EUT) other than the Receipt Date and Test Date
- SECTION 4: Operation of EUT during testing

\* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

## **SECTION 2: Equipment Under Test (EUT)**

### **2.1 Identification of EUT**

|               |                                                                                            |
|---------------|--------------------------------------------------------------------------------------------|
| Description   | Digital Wireless Transmitter                                                               |
| Model Number  | DWT-P30                                                                                    |
| Serial Number | Refer to SECTION 4.2                                                                       |
| Condition     | Engineering prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification  | No Modification by the test lab                                                            |
| Receipt Date  | July 24, 2022                                                                              |
| Test Date     | July 26 to August 4, 2022                                                                  |

## 2.2 Product Description

### General Specification

|        |                                                       |
|--------|-------------------------------------------------------|
| Rating | DC 3.0 V (Battery (2 x AA Batteries)), DC 5.0 V (USB) |
|--------|-------------------------------------------------------|

### Radio Specification

#### <Radio microphone part>\*

|                        |                                                                                           |
|------------------------|-------------------------------------------------------------------------------------------|
| Radio type             | Transmitter                                                                               |
| Modulation type        | $\pi/4$ shift QPSK                                                                        |
| Emission designator    | 192KG1D, 192KG1E                                                                          |
| Necessary bandwidth    | 192 kHz, Manufacturer defined                                                             |
| Channel spacing        | 25 kHz                                                                                    |
| Frequency of operation | 470.125 MHz to 607.875 MHz, 614.125 MHz to 615.875 MHz                                    |
| RF power               | 470.125 MHz to 607.875 MHz: 25 mW, 10 mW, 2 mW<br>614.125 MHz to 615.875 MHz: 10 mW, 2 mW |
| Antenna gain           | 2.8 dBi max                                                                               |
| AF Specification       | 20 Hz - 22000 Hz, Maximum input: -22 dBu (MIC level, ATT 0 dB)                            |
| Operating temperature  | 0 deg. C to 50 deg. C                                                                     |

#### <RF remote part>

|                                |                       |
|--------------------------------|-----------------------|
| Radio Type                     | Transceiver           |
| Modulation type                | DSSS                  |
| Frequency of Operation         | 2405 MHz to 2475 MHz  |
| Channel spacing                | 5 MHz                 |
| Method of frequency generation | Synthesizer           |
| Antenna Gain                   | -3.0 dBi max          |
| Operating temperature          | 0 deg. C to 50 deg. C |

\*This test report applies for Radio microphone part.

## **SECTION 3: Test Specification, Procedures & Results**

### **3.1 Test Specification**

|                    |                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Specification | FCC Part 15 Subpart C<br>The latest version on the first day of the testing period                                                                                                                          |
| Title              | FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators<br>Section 15.236 Operation of wireless microphones in the bands 54-72 MHz,<br>76-88 MHz, 174-216 MHz, 470-608 MHz and 614-698 MHz. |

\* The EUT complies with FCC Part 15 Subpart B.

### **3.2 Procedures and Results**

| Item                                     | Test Procedure                               | Specification                                | Worst margin                      | Results        | Remarks   |
|------------------------------------------|----------------------------------------------|----------------------------------------------|-----------------------------------|----------------|-----------|
| Conducted Emission                       | ANSI C63.10-2013<br>6. Standard test methods | FCC: Section 15.207                          | 13.91 dB<br>0.37850 MHz, QP, N    | Complied<br>a) | Conducted |
| RF Output Power                          | ANSI C63.10:2013<br>Clause 11.9.2.3          | FCC: Section 15.236 (d) (1) (2)              | See data.                         | Complied<br>b) | Conducted |
| Emission Bandwidth<br>(-20 dB Bandwidth) | ANSI C63.10:2013<br>Clause 6.9               | FCC: Section 15.236 (f) (1) (2)              | See data.                         | Complied<br>c) | Conducted |
| Emission mask                            | EN 300 422-1 V1.4.2<br>Clause 8.3            | FCC: Section 15.236 (g)<br>KDB 206256 IV (d) | See data.                         | Complied<br>d) | Conducted |
| Transmitter unwanted<br>emissions        | EN 300 422-1 V1.4.2<br>Clause 8.4            | FCC: Section 15.236 (g)<br>KDB 206256 IV (d) | 3.0 dB<br>471.125 MHz, Horizontal | Complied<br>e) | Radiated  |
| Frequency Tolerance                      | ANSI C63.10:2013<br>Clause 6.8               | FCC: Section 15.236 (f) (3)                  | See data.                         | Complied<br>f) | Conducted |

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.

- a) Refer to APPENDIX 1 (data of Conducted Emission)
- b) Refer to APPENDIX 1 (data of RF power output)
- c) Refer to APPENDIX 1 (data of Emission Bandwidth (-20 dB Bandwidth))
- d) Refer to APPENDIX 1 (data of Emission mask)
- e) Refer to APPENDIX 1 (data of Transmitter unwanted emissions)
- f) Refer to APPENDIX 1 (data of Frequency Tolerance)

#### **FCC Part 15.31 (e)**

This EUT provides the stable voltage constantly to RF Module regardless of input voltage. However, frequency tolerance test was performed according to section 15.236.

#### **FCC Part 15.203 Antenna requirement**

This section does not apply to device operated under section 15.236 (KDB 206256 D01).

### **3.3 Addition to Standard**

No addition, exclusion nor deviation has been made from the standard.

### 3.4 Uncertainty

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.

Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor  $k=2$ .

#### Conducted emission

| Using Item | Frequency range       | Uncertainty (+/-) |
|------------|-----------------------|-------------------|
| AMN (LISN) | 0.009 MHz to 0.15 MHz | 3.7 dB            |
|            | 0.15 MHz to 30 MHz    | 3.3 dB            |

| Spurious Emission (EUT height: 1.5 m)<br>(Measurement Distance 3 m) | Uncertainty (+/-) |
|---------------------------------------------------------------------|-------------------|
| 25 MHz to 200 MHz                                                   | 5.6 dB            |
| 200 MHz to 1000 MHz                                                 | 4.0 dB            |
| 1 GHz to 12.75 GHz                                                  | 4.6 dB            |

| Antenna terminal test           | Uncertainty (+/-) |
|---------------------------------|-------------------|
| RF output power                 | 1.3 dB            |
| Emission Bandwidth (Span 1 MHz) | 0.96 %            |
| Emission mask                   | 1.9 dB            |
| Frequency Tolerance             | 0.01541 ppm       |



### 3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

\*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919

ISED Lab Company Number: 2973C / CAB identifier: JP0002

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan

Telephone: +81-596-24-8999

| Test site                  | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms            | Maximum measurement distance |
|----------------------------|----------------------------|------------------------------------------------------------------|------------------------|------------------------------|
| No.1 semi-anechoic chamber | 19.2 x 11.2 x 7.7          | 7.0 x 6.0                                                        | No.1 Power source room | 10 m                         |
| No.2 semi-anechoic chamber | 7.5 x 5.8 x 5.2            | 4.0 x 4.0                                                        | -                      | 3 m                          |
| No.3 semi-anechoic chamber | 12.0 x 8.5 x 5.9           | 6.8 x 5.75                                                       | No.3 Preparation room  | 3 m                          |
| No.3 shielded room         | 4.0 x 6.0 x 2.7            | N/A                                                              | -                      | -                            |
| No.4 semi-anechoic chamber | 12.0 x 8.5 x 5.9           | 6.8 x 5.75                                                       | No.4 Preparation room  | 3 m                          |
| No.4 shielded room         | 4.0 x 6.0 x 2.7            | N/A                                                              | -                      | -                            |
| No.5 semi-anechoic chamber | 6.0 x 6.0 x 3.9            | 6.0 x 6.0                                                        | -                      | -                            |
| No.5 measurement room      | 6.4 x 6.4 x 3.0            | 6.4 x 6.4                                                        | -                      | -                            |
| No.6 shielded room         | 4.0 x 4.5 x 2.7            | 4.0 x 4.5                                                        | -                      | -                            |
| No.6 measurement room      | 4.75 x 5.4 x 3.0           | 4.75 x 4.15                                                      | -                      | -                            |
| No.7 shielded room         | 4.7 x 7.5 x 2.7            | 4.7 x 7.5                                                        | -                      | -                            |
| No.8 measurement room      | 3.1 x 5.0 x 2.7            | 3.1 x 5.0                                                        | -                      | -                            |
| No.9 measurement room      | 8.8 x 4.6 x 2.8            | 2.4 x 2.4                                                        | -                      | -                            |
| No.10 shielded room        | 3.8 x 2.8 x 2.8            | 3.8 x 2.8                                                        | -                      | -                            |
| No.11 measurement room     | 4.0 x 3.4 x 2.5            | N/A                                                              | -                      | -                            |
| No.12 measurement room     | 2.6 x 3.4 x 2.5            | N/A                                                              | -                      | -                            |
| Large Chamber              | 16.9 x 22.1 x 10.17        | 16.9 x 22.1                                                      | -                      | 10 m                         |
| Small Chamber              | 5.3 x 6.69 x 3.59          | 5.3 x 6.69                                                       | -                      | -                            |

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

## **SECTION 4: Operation of EUT during testing**

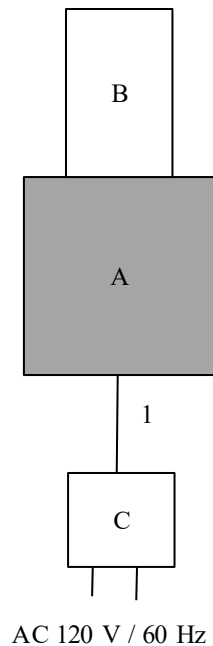
### **4.1 Operating Mode(s)**

| <b>Mode</b>                                                                                                                                                                                                                                         | <b>Remarks*</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Transmitting (Tx), Power setting: 2 mW                                                                                                                                                                                                              | Typ. 2 mW       |
| Transmitting (Tx), Power setting: 10 mW                                                                                                                                                                                                             | Typ. 10 mW      |
| Transmitting (Tx), Power setting: 25 mW                                                                                                                                                                                                             | Typ. 25 mW      |
| *Transmitting duty was 100 % on all tests.                                                                                                                                                                                                          |                 |
| *Power of the EUT was set by the software as follows;<br>Power settings: 2 mW, 10 mW, 25 mW<br>Software: Version: 0.01 (220621A)<br>(Date: 2022.06.21 Storage location: EUT memory)                                                                 |                 |
| *This setting of software is the worst case.<br>Any conditions under the normal use do not exceed the condition of setting.<br>In addition, end users cannot change the settings of the output power of the product except 2 mW and 10 mW settings. |                 |

\*The details of Operating mode(s)

| Test Item                                                                                                                                         | Tested frequency |        | Power setting | Modulation                           | Remarks |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------|---------------|--------------------------------------|---------|
| Conducted Emission                                                                                                                                | 470.125 MHz      | (Low)  | 25 mW         | Digital modulation (PN9 data packet) | -       |
|                                                                                                                                                   | 543.000MHz       | (Mid)  |               |                                      |         |
|                                                                                                                                                   | 607.875 MHz      | (High) |               |                                      |         |
|                                                                                                                                                   | 614.125 MHz      | (Low)  | 10 mW         |                                      |         |
|                                                                                                                                                   | 615.000 MHz      | (Mid)  |               |                                      |         |
| 615.875 MHz                                                                                                                                       | (High)           |        |               |                                      |         |
| RF power output                                                                                                                                   | 470.125 MHz      | (Low)  | 2 mW,         | Digital modulation (PN9 data packet) | -       |
|                                                                                                                                                   | 543.000MHz       | (Mid)  | 10 mW,        |                                      |         |
|                                                                                                                                                   | 607.875 MHz      | (High) | 25 mW         |                                      |         |
|                                                                                                                                                   | 614.125 MHz      | (Low)  | 2 mW,         |                                      |         |
|                                                                                                                                                   | 615.000 MHz      | (Mid)  | 10 mW         |                                      |         |
| Emission Bandwidth                                                                                                                                | 615.875 MHz      | (High) |               |                                      |         |
|                                                                                                                                                   | 470.125 MHz      | (Low)  | 2 mW,         | Digital modulation (PN9 data packet) | -       |
|                                                                                                                                                   | 543.000 MHz      | (Mid)  | 10 mW,        |                                      |         |
|                                                                                                                                                   | 607.875 MHz      | (High) | 25 mW         |                                      |         |
|                                                                                                                                                   | 614.125 MHz      | (Low)  | 2 mW,         |                                      |         |
| 615.000 MHz                                                                                                                                       | (Mid)            | 10 mW  |               |                                      |         |
| Emission Mask                                                                                                                                     | 615.875 MHz      | (High) |               |                                      |         |
|                                                                                                                                                   | 470.125 MHz      | (Low)  | 2 mW,         | Digital modulation (PN9 data packet) | -       |
|                                                                                                                                                   | 543.000 MHz      | (Mid)  | 10 mW,        |                                      |         |
|                                                                                                                                                   | 607.875 MHz      | (High) | 25 mW         |                                      |         |
|                                                                                                                                                   | 614.125 MHz      | (Low)  | 2 mW,         |                                      |         |
| 615.000 MHz                                                                                                                                       | (Mid)            | 10 mW  |               |                                      |         |
| Transmitter unwanted emissions                                                                                                                    | 615.875 MHz      | (High) |               |                                      |         |
|                                                                                                                                                   | 470.125 MHz      | (Low)  | 25 mW         | Digital modulation (PN9 data packet) | -       |
|                                                                                                                                                   | 543.000 MHz      | (Mid)  |               |                                      |         |
|                                                                                                                                                   | 607.875 MHz      | (High) |               |                                      |         |
|                                                                                                                                                   | 614.125 MHz      | (Low)  | 10 mW         |                                      |         |
| 615.000 MHz                                                                                                                                       | (Mid)            |        |               |                                      |         |
| 615.875 MHz                                                                                                                                       | (High)           |        |               |                                      |         |
| Frequency Tolerance                                                                                                                               | 543.000 MHz      | (Mid)  | 25 mW         | No modulation                        | *1)     |
|                                                                                                                                                   | 615.000 MHz      | (Mid)  | 10 mW         |                                      |         |
| *1) There is no difference in frequency generating method on each frequency. Therefore the test was performed on Mid channel as a representative. |                  |        |               |                                      |         |

## 4.2 Configuration and Peripherals



\* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

\*\* This EUT has two types of power supply, USB power Supply and Battery power Supply.

The test was performed with USB power Supply that was the worst spurious emission level.

### Description of EUT and Support Equipment

| No. | Item                         | Model number | Serial Number              | Manufacturer           | Remarks |
|-----|------------------------------|--------------|----------------------------|------------------------|---------|
| A   | Digital Wireless Transmitter | DWT-P30      | #910010 *1)<br>#910009 *2) | Sony Group Corporation | EUT     |
| B   | Dynamic Microphone           | F-112        | 14282                      | Sony Group Corporation | -       |
| C   | AC Adapter                   | 0301PQA      | MM-NGA                     | Mitsumi Electric Co.   | -       |

\*1) Used for Conducted Emission test and Radiated Emission test

\*2) Used for Antenna Terminal conducted test

### List of Cables Used

| No. | Name     | Length (m) | Shield   |           | Remarks |
|-----|----------|------------|----------|-----------|---------|
|     |          |            | Cable    | Connector |         |
| 1   | DC Cable | 1.1        | Shielded | Shielded  | -       |

## **SECTION 5: Conducted Emission**

### **Test Procedure and Conditions**

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

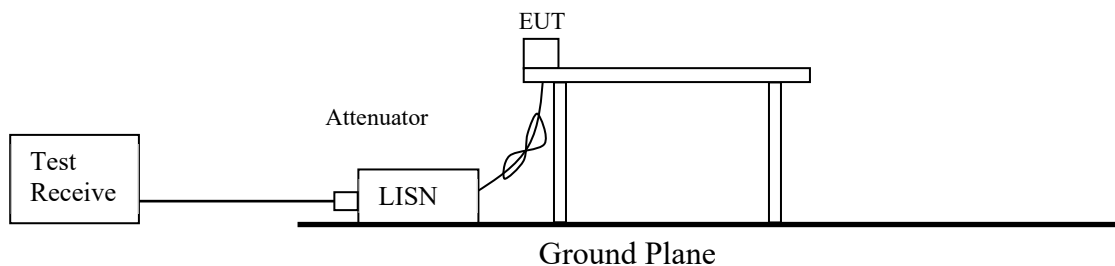
The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to two decimal place, so some differences might be observed.

|                          |                             |
|--------------------------|-----------------------------|
| <b>Detector</b>          | <b>: QP and CISPR AV</b>    |
| <b>Measurement Range</b> | <b>: 0.15 MHz to 30 MHz</b> |
| <b>Test Data</b>         | <b>: APPENDIX</b>           |
| <b>Test Result</b>       | <b>: Pass</b>               |

**Figure 1: Test Setup**



## **SECTION 6: Radiated Spurious Emission**

### **Test Procedure**

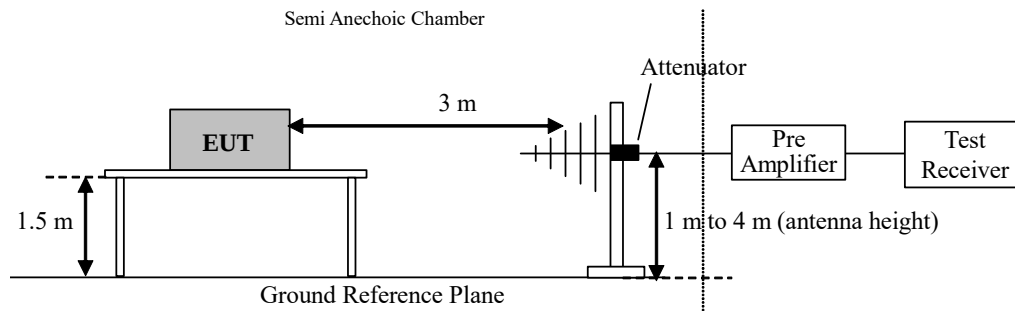
- 1) EUT was placed on a platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The Radiated Electric Field Strength has been measured in semi anechoic chamber at a distance of 3 m.  
The measuring antenna height was varied between 1 to 4 m and the turn table was rotated a full revolution in order to obtain the maximum value of the electric field strength.  
The measurements were performed for both vertical and horizontal antenna polarization.
- 2) Exchanged the EUT to the Substitution Antenna, the measurement was set for the same height 1.5 m as the EUT. The frequency below 1 GHz of the Substitution Antenna was used the Half wave dipole Antenna, which was tuned the measured frequency in 1).  
The frequency above 1 GHz of the Substitution Antenna was used Horn Antenna.  
The Substitution Antenna was connected to the Signal Generator, and the polarized electromagnetic radiation of the Substitution Antenna was matched with the one of the measuring Antenna, which was set with the Signal Generator to the measured frequency in 1). Then, we set with the Output power (CW) of the Signal Generator where the measuring electromagnetic field strength is equal to the measured value in 1) by means of varying the measuring antenna height between 1 to 4 m to obtain maximum receiving level.  
Its Output power of Signal Generator was recorded.
- 3) Effective radiated power was calculated by subtracting the cable loss and the attenuator loss connected between the Signal Generator and the Substitution Antenna from the Output power of the Signal Generator recorded in 2).  
For the usage of the Antenna (Horn Antenna) except for the Half wave dipole Antenna (2.15 dBi) for the Substitution Antenna, the Effective radiated power was calculated by compensating the finite difference in the Antenna gain of the Half wave dipole Antenna, and Substitution Antenna.

|              |                   |                  |             |
|--------------|-------------------|------------------|-------------|
| Frequency    | 25 MHz to 200 MHz | 200 MHz to 1 GHz | Above 1 GHz |
| Antenna Type | Biconical         | Logperiodic      | Horn        |

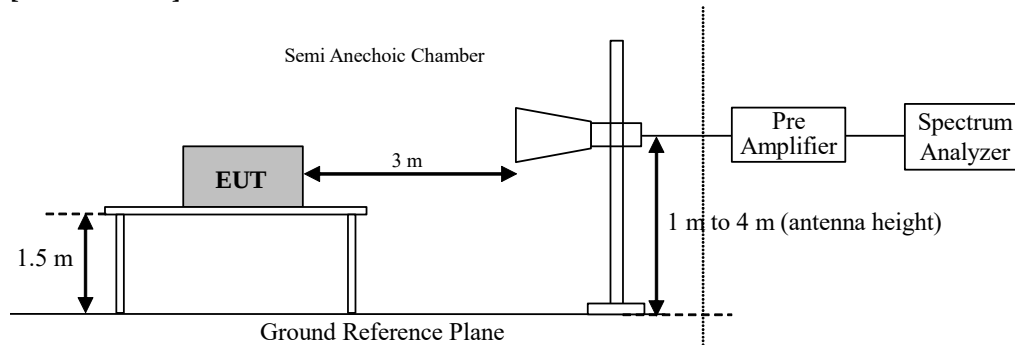
|                 |                  |                 |                          |
|-----------------|------------------|-----------------|--------------------------|
| Frequency       | 25 MHz to 30 MHz | 30 MHz to 1 GHz | Above 1 GHz              |
| Instrument used | Test Receiver    |                 | Spectrum Analyzer        |
| Detector        | QP               |                 | RMS Average              |
| IF Bandwidth    | BW: 9 kHz        | BW: 120 kHz     | RBW: 1 MHz<br>VBW: 3 MHz |
| Test Distance   | 3 m              |                 |                          |

**Figure 1: Test Setup**

**[25 MHz to 1 GHz]**



**[Above 1 GHz]**



- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

-This EUT has two types of power supply, USB power Supply/ Battery power Supply.  
The test was performed with the worst case which was confirmed in pre-check.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

|                          |                          |
|--------------------------|--------------------------|
| <b>Measurement range</b> | <b>: 25 MHz to 7 GHz</b> |
| <b>Test data</b>         | <b>: APPENDIX</b>        |
| <b>Test result</b>       | <b>: Pass</b>            |

**\*Test was performed with 10<sup>th</sup> harmonics of fundamental.**

## **SECTION 7: Antenna Terminal Conducted Tests**

### **Test Procedure**

The tests were made with below setting connected to the antenna port.

| Test                                                 | Span                                        | RBW                                 | VBW                   | Sweep time | Detector | Trace        | Instrument used                    |
|------------------------------------------------------|---------------------------------------------|-------------------------------------|-----------------------|------------|----------|--------------|------------------------------------|
| RF Output Power                                      | -                                           | -                                   | -                     | Auto       | Average  | -            | Power Meter<br>(Sensor: 50 MHz BW) |
| Emission Bandwidth                                   | 2 times to 5 times of<br>occupied bandwidth | 1 to 5%<br>of Occupied<br>bandwidth | Three times<br>of RBW | Auto       | Peak *1) | Max Hold *1) | Spectrum Analyzer                  |
| *1) Peak hold was applied as Worst-case measurement. |                                             |                                     |                       |            |          |              |                                    |

#### **[Emission mask]**

The EUT was modulated with PN9 audio data packet.

The spectrum mask was measured in accordance with section 8.3.2 of EN 300 422-1.

The measurements were made under normal condition.

#### **[Frequency Tolerance]**

The EUT was tested with a new or fully charged battery.

The frequency of the EUT was recorded over a temperature variation of +50 deg. C to -20 deg. C by 10 deg. C step.

For Battery End Point, test was performed at the voltage just before the battery has run out.

EUT power supply was varied between 85 % and 115 % of nominal and the frequency of the EUT was recorded when temperature is 20 deg. C.

The test results and limit are rounded off to two decimals place, so some differences might be observed.

**Test data** : APPENDIX

**Test result** : Pass

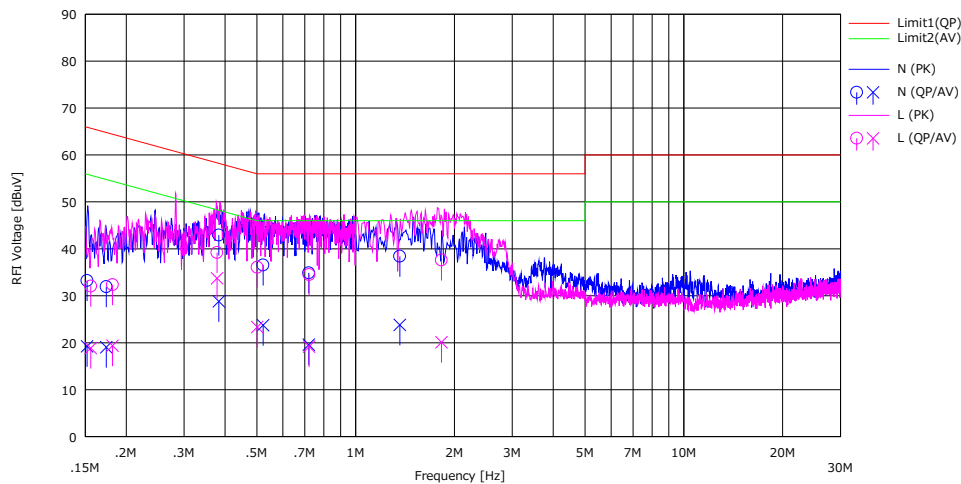


## APPENDIX 1: Test Data

### Conducted Emission

Test place Ise EMC Lab. No.1 Semi Anechoic Chamber  
Date July 26, 2022  
Temperature / Humidity 23 deg. C / 71 % RH  
Engineer Nachi Konegawa  
Mode Tx 543.000 MHz

Limit : FCC\_Part 15 Subpart C(15.207)

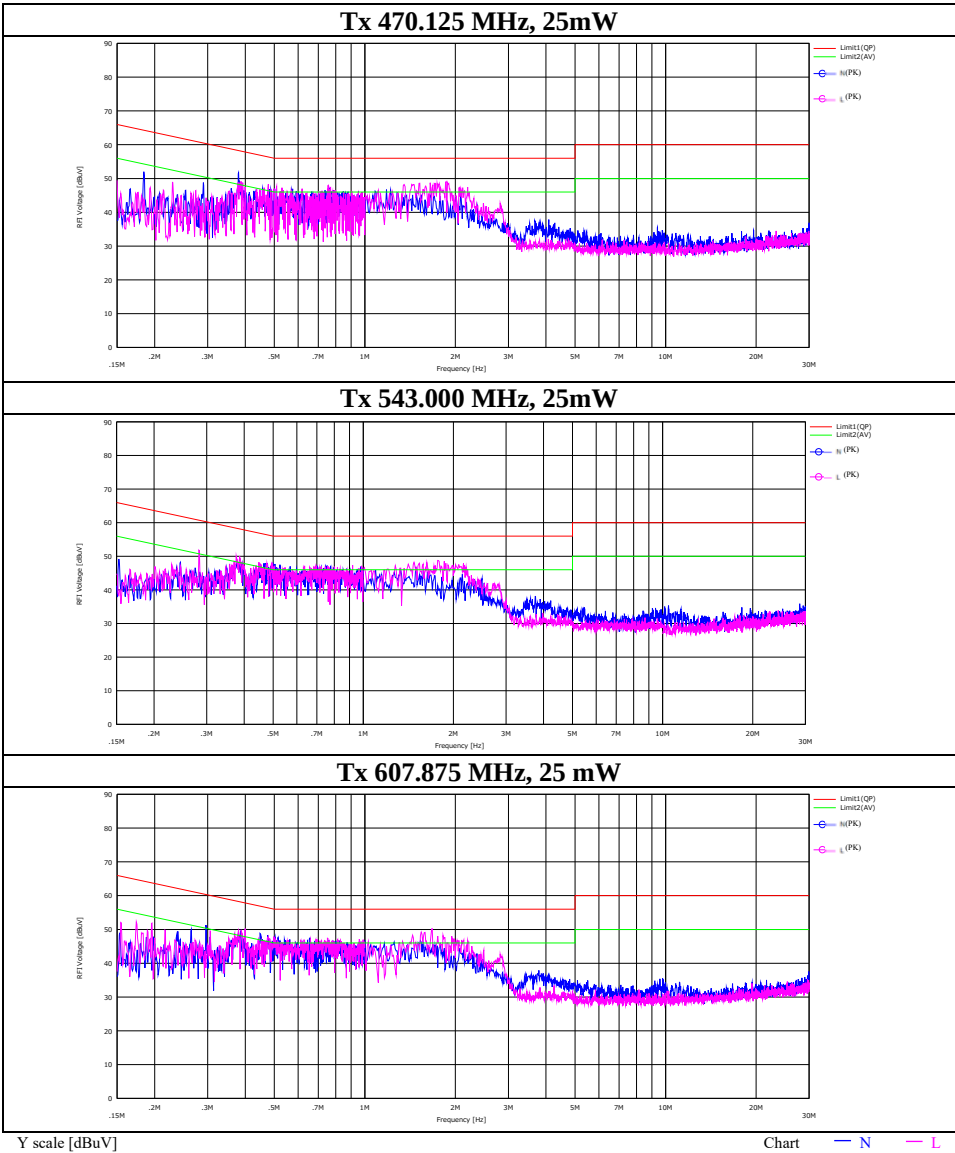


| No. | Freq.<br>[MHz] | Reading        |                | LISN<br>[dB] | LOSS<br>[dB] | Results        |                | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|----------------|--------------|--------------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | <QP><br>[dBuV] | <AV><br>[dBuV] |              |              | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dB] | <AV><br>[dB] |       |         |
| 1   | 0.15195        | 20.00          | 6.00           | 0.14         | 13.09        | 33.23          | 19.23          | 65.89          | 55.89          | 32.66        | 36.66        | N     |         |
| 2   | 0.17376        | 18.70          | 5.80           | 0.14         | 13.10        | 31.94          | 19.04          | 64.78          | 54.78          | 32.84        | 35.74        | N     |         |
| 3   | 0.38305        | 29.60          | 15.50          | 0.15         | 13.15        | 42.90          | 28.80          | 58.21          | 48.21          | 15.31        | 19.41        | N     |         |
| 4   | 0.52210        | 23.20          | 10.40          | 0.16         | 13.17        | 36.53          | 23.73          | 56.00          | 46.00          | 19.47        | 22.27        | N     |         |
| 5   | 0.72000        | 21.50          | 6.20           | 0.17         | 13.21        | 34.88          | 19.58          | 56.00          | 46.00          | 21.12        | 26.42        | N     |         |
| 6   | 1.36300        | 24.90          | 10.30          | 0.20         | 13.30        | 38.40          | 23.80          | 56.00          | 46.00          | 17.60        | 22.20        | N     |         |
| 7   | 0.15595        | 18.80          | 5.60           | 0.17         | 13.09        | 32.06          | 18.86          | 65.68          | 55.68          | 33.62        | 36.82        | L     |         |
| 8   | 0.18168        | 19.10          | 6.10           | 0.16         | 13.10        | 32.36          | 19.36          | 64.41          | 54.41          | 32.05        | 35.05        | L     |         |
| 9   | 0.37820        | 25.90          | 20.40          | 0.17         | 13.15        | 39.22          | 33.72          | 58.32          | 48.32          | 19.10        | 14.60        | L     |         |
| 10  | 0.50140        | 22.70          | 10.00          | 0.18         | 13.17        | 36.05          | 23.35          | 56.00          | 46.00          | 19.95        | 22.65        | L     |         |
| 11  | 0.72160        | 21.10          | 5.80           | 0.18         | 13.21        | 34.49          | 19.19          | 56.00          | 46.00          | 21.51        | 26.81        | L     |         |
| 12  | 1.82600        | 24.00          | 6.50           | 0.23         | 13.37        | 37.60          | 20.10          | 56.00          | 46.00          | 18.40        | 25.90        | L     |         |

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)  
Except for the above table: adequate margin data below the limits.

Conducted Emission

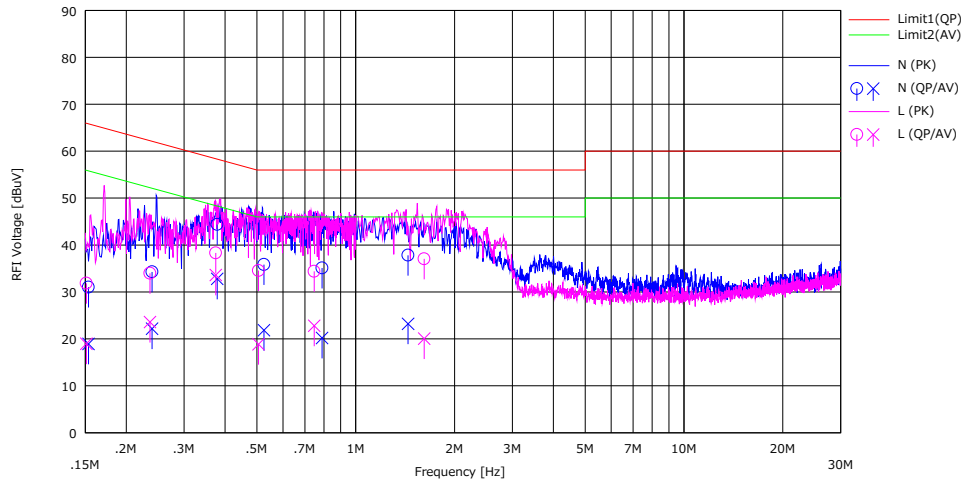
|                        |                                         |
|------------------------|-----------------------------------------|
| Test place             | Ise EMC Lab. No.1 Semi Anechoic Chamber |
| Date                   | July 26, 2022                           |
| Temperature / Humidity | 23 deg. C / 71 % RH                     |
| Engineer               | Nachi Konegawa                          |
| Mode                   | Tx                                      |



## Conducted Emission

Test place Ise EMC Lab. No.1 Semi Anechoic Chamber  
Date July 26, 2022  
Temperature / Humidity 23 deg. C / 71 % RH  
Engineer Nachi Konegawa  
Mode Tx 615.000 MHz

Limit : FCC\_Part 15 Subpart C(15.207)

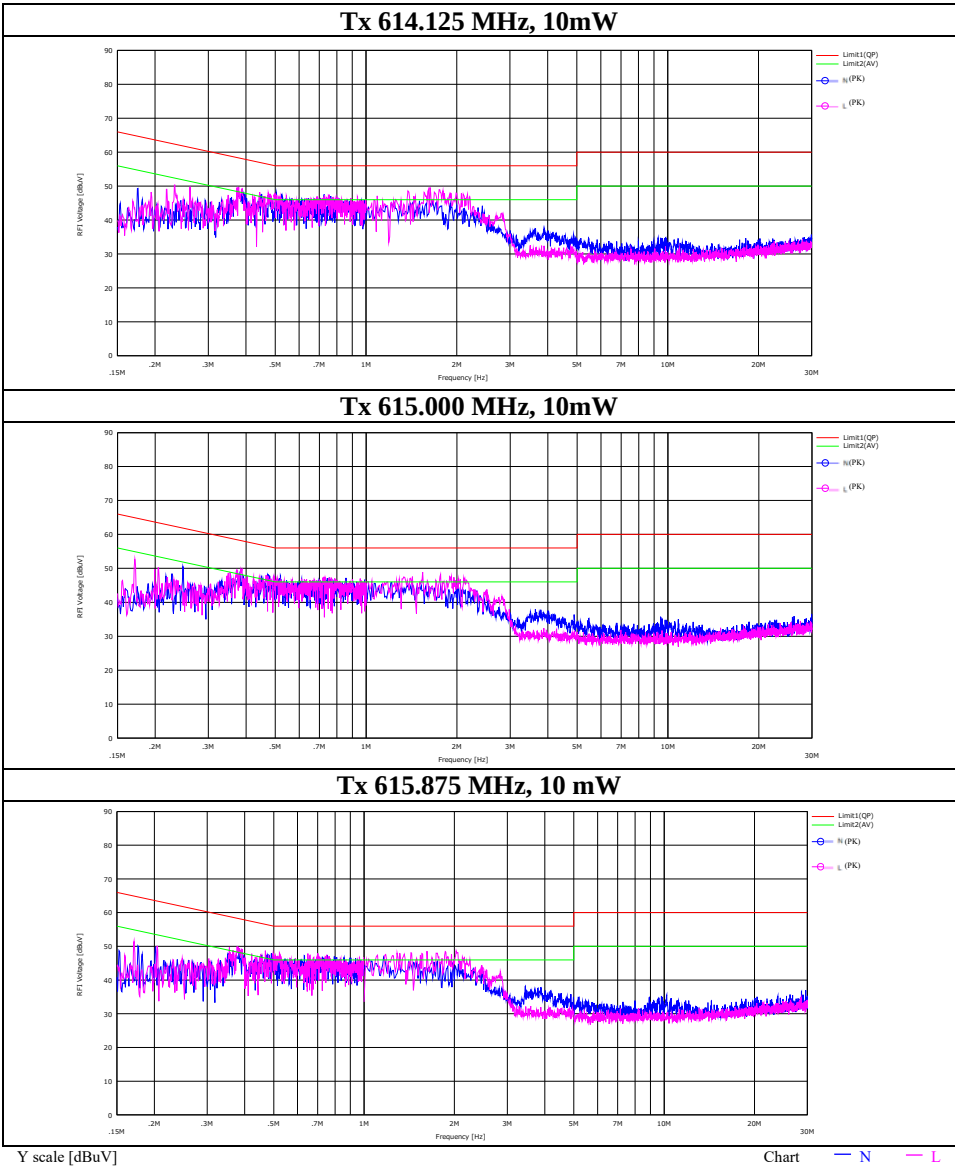


| No. | Freq.<br>[MHz] | Reading        |                | LISN | LOSS  | Results        |                | Limit          |                | Margin       |              | Phase | Comment |
|-----|----------------|----------------|----------------|------|-------|----------------|----------------|----------------|----------------|--------------|--------------|-------|---------|
|     |                | <QP><br>[dBuV] | <AV><br>[dBuV] |      |       | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dBuV] | <AV><br>[dBuV] | <QP><br>[dB] | <AV><br>[dB] |       |         |
| 1   | 0.15345        | 17.80          | 5.70           | 0.14 | 13.09 | 31.03          | 18.93          | 65.81          | 55.81          | 34.78        | 36.88        | N     |         |
| 2   | 0.23970        | 21.00          | 8.90           | 0.15 | 13.12 | 34.27          | 22.17          | 62.11          | 52.11          | 27.84        | 29.94        | N     |         |
| 3   | 0.37850        | 31.10          | 19.50          | 0.15 | 13.15 | 44.40          | 32.80          | 58.31          | 48.31          | 13.91        | 15.51        | N     |         |
| 4   | 0.52510        | 22.50          | 8.50           | 0.16 | 13.18 | 35.84          | 21.84          | 56.00          | 46.00          | 20.16        | 24.16        | N     |         |
| 5   | 0.78965        | 21.70          | 6.80           | 0.17 | 13.22 | 35.09          | 20.19          | 56.00          | 46.00          | 20.91        | 25.81        | N     |         |
| 6   | 1.44360        | 24.30          | 9.70           | 0.20 | 13.31 | 37.81          | 23.21          | 56.00          | 46.00          | 18.19        | 22.79        | N     |         |
| 7   | 0.15110        | 18.60          | 5.70           | 0.17 | 13.09 | 31.86          | 18.96          | 65.94          | 55.94          | 34.08        | 36.98        | L     |         |
| 8   | 0.23620        | 20.70          | 10.30          | 0.16 | 13.12 | 33.98          | 23.58          | 62.23          | 52.23          | 28.25        | 28.65        | L     |         |
| 9   | 0.37460        | 25.00          | 20.30          | 0.17 | 13.14 | 38.31          | 33.61          | 58.40          | 48.40          | 20.09        | 14.79        | L     |         |
| 10  | 0.50580        | 21.20          | 5.50           | 0.18 | 13.17 | 34.55          | 18.85          | 56.00          | 46.00          | 21.45        | 27.15        | L     |         |
| 11  | 0.74720        | 21.00          | 9.40           | 0.18 | 13.21 | 34.39          | 22.79          | 56.00          | 46.00          | 21.61        | 23.21        | L     |         |
| 12  | 1.61560        | 23.50          | 6.50           | 0.22 | 13.34 | 37.06          | 20.06          | 56.00          | 46.00          | 18.94        | 25.94        | L     |         |

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)  
Except for the above table: adequate margin data below the limits.

Conducted Emission

|                        |                                         |
|------------------------|-----------------------------------------|
| Test place             | Ise EMC Lab. No.1 Semi Anechoic Chamber |
| Date                   | July 26, 2022                           |
| Temperature / Humidity | 23 deg. C / 71 % RH                     |
| Engineer               | Nachi Konegawa                          |
| Mode                   | Tx                                      |



## RF Output Power

Test place Ise EMC Lab. No.8 Measurement Room  
Date July 26, 2022  
Temperature / Humidity 23 deg. C / 66 % RH  
Engineer Hiroki Numata  
Mode Tx 470.125 MHz to 607.875 MHz / 614.125 MHz to 615.875 MHz

| Power Setting | Channel | Freq.   | Reading Average | Cable Loss | Atten. Loss | Ant Gain | Result Average [EIRP] |       | Limit [EIRP] | Margin | Remarks |
|---------------|---------|---------|-----------------|------------|-------------|----------|-----------------------|-------|--------------|--------|---------|
|               |         | [MHz]   | [dBm]           | [dB]       | [dB]        | [dBi]    | [dBm]                 | [mW]  | [mW]         | [dB]   |         |
| 2mW           | Low     | 470.125 | -16.94          | 0.15       | 19.70       | 2.80     | 5.71                  | 3.72  | 50           | 11.28  |         |
|               | Mid     | 543.000 | -16.93          | 0.15       | 19.70       | 2.80     | 5.72                  | 3.73  | 50           | 11.27  |         |
|               | High    | 607.875 | -17.03          | 0.15       | 19.70       | 2.80     | 5.62                  | 3.65  | 50           | 11.37  |         |
| 10mW          | Low     | 470.125 | -10.75          | 0.15       | 19.70       | 2.80     | 11.90                 | 15.49 | 50           | 5.09   |         |
|               | Mid     | 543.000 | -10.73          | 0.15       | 19.70       | 2.80     | 11.92                 | 15.56 | 50           | 5.07   |         |
|               | High    | 607.875 | -11.02          | 0.15       | 19.70       | 2.80     | 11.63                 | 14.55 | 50           | 5.36   |         |
| 25mW          | Low     | 470.125 | -5.87           | 0.15       | 19.70       | 2.80     | 16.78                 | 47.64 | 50           | 0.21   |         |
|               | Mid     | 543.000 | -5.76           | 0.15       | 19.70       | 2.80     | 16.89                 | 48.87 | 50           | 0.10   |         |
|               | High    | 607.875 | -5.97           | 0.15       | 19.70       | 2.80     | 16.68                 | 46.56 | 50           | 0.31   |         |

Calculation formula:

$$\text{Result} = \text{Reading} + \text{Cable Loss} + \text{Atten. Loss} + \text{Ant Gain}$$

Cable or Atten. was not used for factor 0.00 dB of the above table.

| Power Setting | Channel | Freq.   | Reading Average | Cable Loss | Atten. Loss | Ant Gain | Result Average [EIRP] |       | Limit [EIRP] | Margin | Remarks |
|---------------|---------|---------|-----------------|------------|-------------|----------|-----------------------|-------|--------------|--------|---------|
|               |         | [MHz]   | [dBm]           | [dB]       | [dB]        | [dBi]    | [dBm]                 | [mW]  | [mW]         | [dB]   |         |
| 2mW           | Low     | 614.125 | -17.05          | 0.15       | 19.70       | 2.80     | 5.60                  | 3.63  | 20           | 7.41   |         |
|               | Mid     | 615.000 | -16.99          | 0.15       | 19.70       | 2.80     | 5.66                  | 3.68  | 20           | 7.35   |         |
|               | High    | 615.875 | -17.03          | 0.15       | 19.70       | 2.80     | 5.62                  | 3.65  | 20           | 7.39   |         |
| 10mW          | Low     | 614.125 | -11.02          | 0.15       | 19.70       | 2.80     | 11.63                 | 14.55 | 20           | 1.38   |         |
|               | Mid     | 615.000 | -11.01          | 0.15       | 19.70       | 2.80     | 11.64                 | 14.59 | 20           | 1.37   |         |
|               | High    | 615.875 | -11.03          | 0.15       | 19.70       | 2.80     | 11.62                 | 14.52 | 20           | 1.39   |         |

Calculation formula:

$$\text{Result} = \text{Reading} + \text{Cable Loss} + \text{Atten. Loss} + \text{Ant Gain}$$

Cable or Atten. was not used for factor 0.00 dB of the above table.

### Emission Bandwidth

Test place Ise EMC Lab. No.8 Measurement Room  
Date July 26, 2022  
Temperature / Humidity 23 deg. C / 66 % RH  
Engineer Hiroki Numata  
Mode Tx 470.125 MHz to 607.875 MHz

| Power Setting | Channel | Freq.<br>[MHz] | 99 % Occupied Bandwidth<br>[kHz] | Limit<br>[kHz] | Margin<br>[kHz] |
|---------------|---------|----------------|----------------------------------|----------------|-----------------|
| 2 mW          | Low     | 470.125        | 162.9667                         | 200            | 37.0333         |
|               | Mid     | 543.000        | 162.6247                         | 200            | 37.3753         |
|               | High    | 607.875        | 162.6071                         | 200            | 37.3929         |
| 10 mW         | Low     | 470.125        | 163.6488                         | 200            | 36.3512         |
|               | Mid     | 543.000        | 164.2869                         | 200            | 35.7131         |
|               | High    | 607.875        | 163.3945                         | 200            | 36.6055         |
| 25 mW         | Low     | 470.125        | 162.5516                         | 200            | 37.4484         |
|               | Mid     | 543.000        | 163.4756                         | 200            | 36.5244         |
|               | High    | 607.875        | 162.9651                         | 200            | 37.0349         |

| Power Setting | Channel | Freq.<br>[MHz] | 20 dB Bandwidth<br>[kHz] | Limit<br>[kHz] | Margin<br>[kHz] |
|---------------|---------|----------------|--------------------------|----------------|-----------------|
| 2 mW          | Low     | 470.125        | 181.051                  | 200            | 18.949          |
|               | Mid     | 543.000        | 180.992                  | 200            | 19.008          |
|               | High    | 607.875        | 180.728                  | 200            | 19.272          |
| 10 mW         | Low     | 470.125        | 181.071                  | 200            | 18.929          |
|               | Mid     | 543.000        | 181.228                  | 200            | 18.772          |
|               | High    | 607.875        | 180.875                  | 200            | 19.125          |
| 25 mW         | Low     | 470.125        | 181.150                  | 200            | 18.850          |
|               | Mid     | 543.000        | 181.219                  | 200            | 18.781          |
|               | High    | 607.875        | 181.177                  | 200            | 18.823          |

### Emission Bandwidth

Test place Ise EMC Lab. No.8 Measurement Room  
Date July 26, 2022  
Temperature / Humidity 23 deg. C / 66 % RH  
Engineer Hiroki Numata  
Mode Tx 614.125 MHz to 615.875 MHz

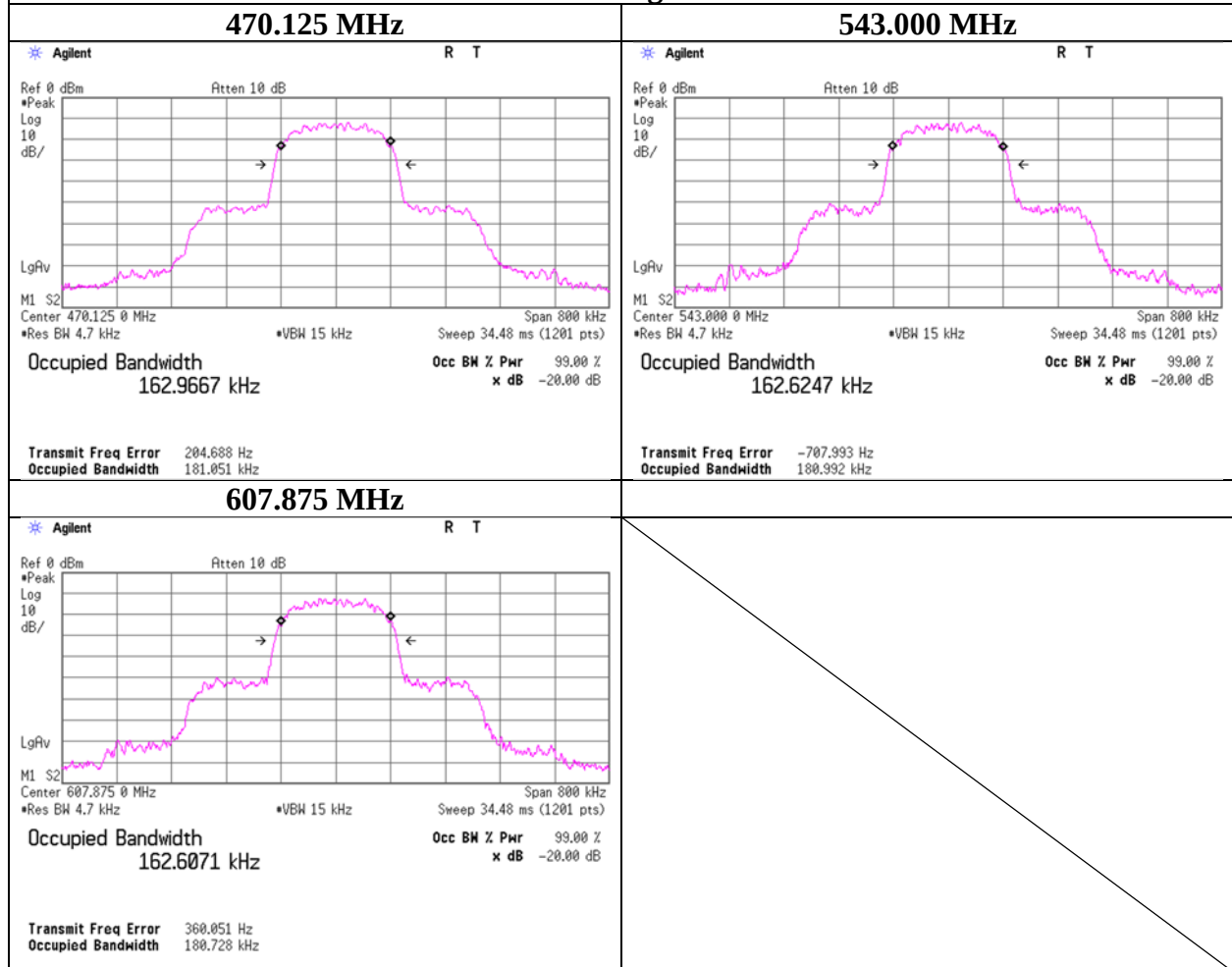
| Power Setting | Channel | Freq.<br>[MHz] | 99 % Occupied Bandwidth<br>[kHz] | Limit<br>[kHz] | Margin<br>[kHz] |
|---------------|---------|----------------|----------------------------------|----------------|-----------------|
| 2 mW          | Low     | 614.125        | 163.6035                         | 200            | 36.3965         |
|               | Mid     | 615.000        | 163.1970                         | 200            | 36.8030         |
|               | High    | 615.875        | 163.3968                         | 200            | 36.6032         |
| 10 mW         | Low     | 614.125        | 163.0728                         | 200            | 36.9272         |
|               | Mid     | 615.000        | 163.0487                         | 200            | 36.9513         |
|               | High    | 615.875        | 163.0872                         | 200            | 36.9128         |

| Power Setting | Channel | Freq.<br>[MHz] | 20 dB Bandwidth<br>[kHz] | Limit<br>[kHz] | Margin<br>[kHz] |
|---------------|---------|----------------|--------------------------|----------------|-----------------|
| 2 mW          | Low     | 614.125        | 181.139                  | 200            | 18.861          |
|               | Mid     | 615.000        | 181.065                  | 200            | 18.935          |
|               | High    | 615.875        | 181.261                  | 200            | 18.739          |
| 10 mW         | Low     | 614.125        | 181.173                  | 200            | 18.827          |
|               | Mid     | 615.000        | 181.273                  | 200            | 18.727          |
|               | High    | 615.875        | 181.109                  | 200            | 18.891          |

## Emission Bandwidth

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | July 26, 2022                      |
| Temperature / Humidity | 23 deg. C / 66 % RH                |
| Engineer               | Hiroki Numata                      |
| Mode                   | Tx 470.125 MHz to 607.875 MHz      |

### Power setting: 2 mW

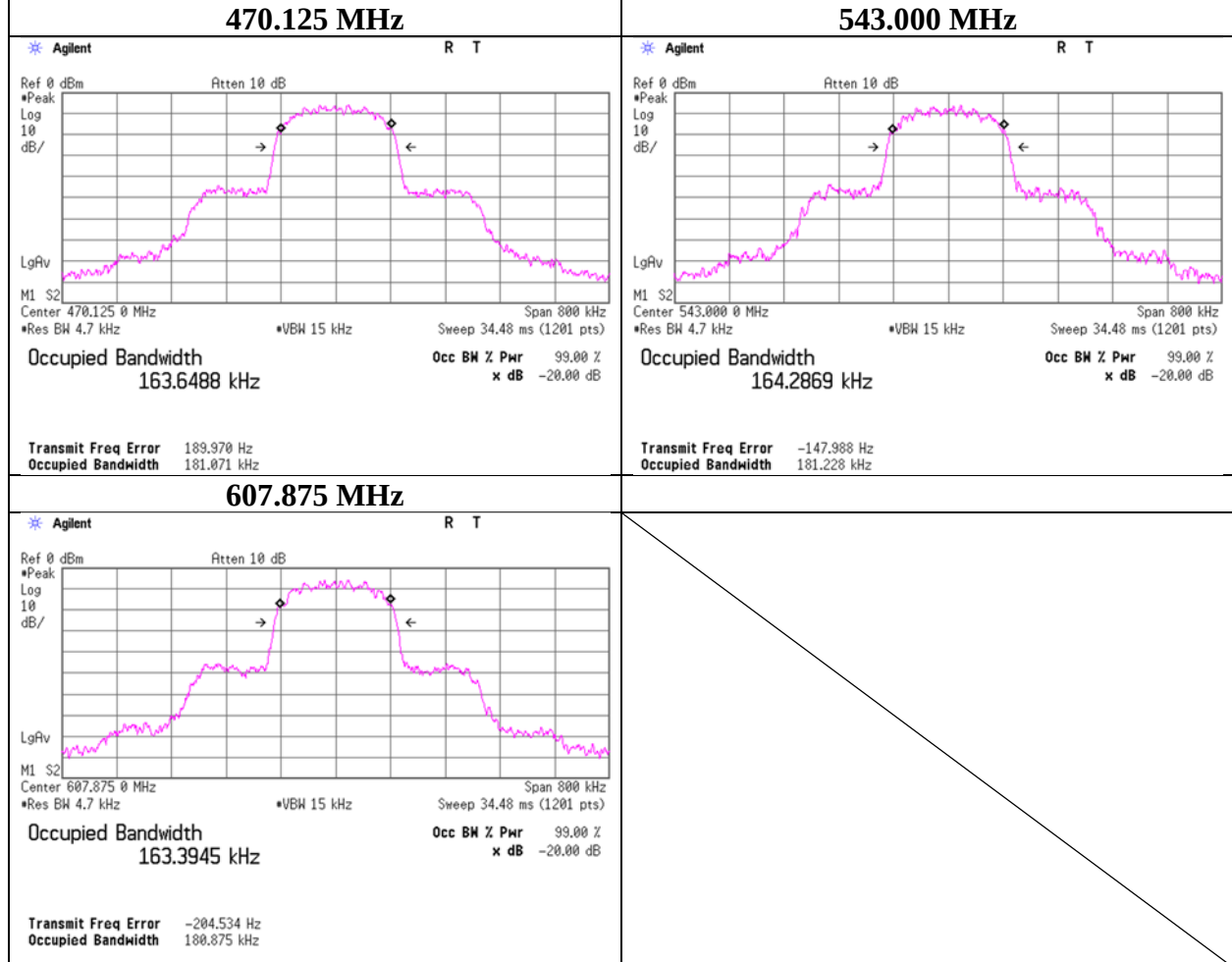




## Emission Bandwidth

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | July 26, 2022                      |
| Temperature / Humidity | 23 deg. C / 66 % RH                |
| Engineer               | Hiroki Numata                      |
| Mode                   | Tx 470.125 MHz to 607.875 MHz      |

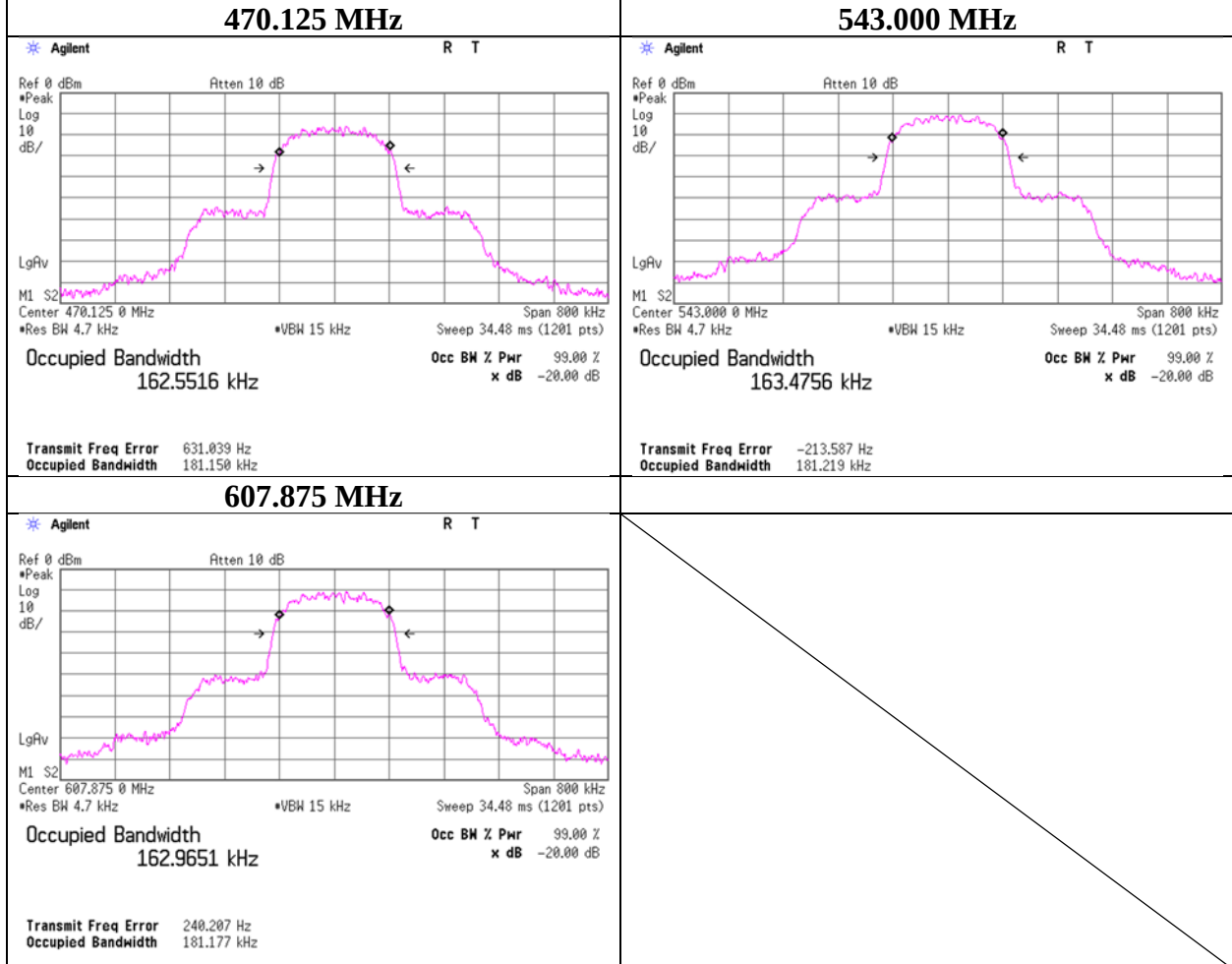
### Power setting: 10 mW



## Emission Bandwidth

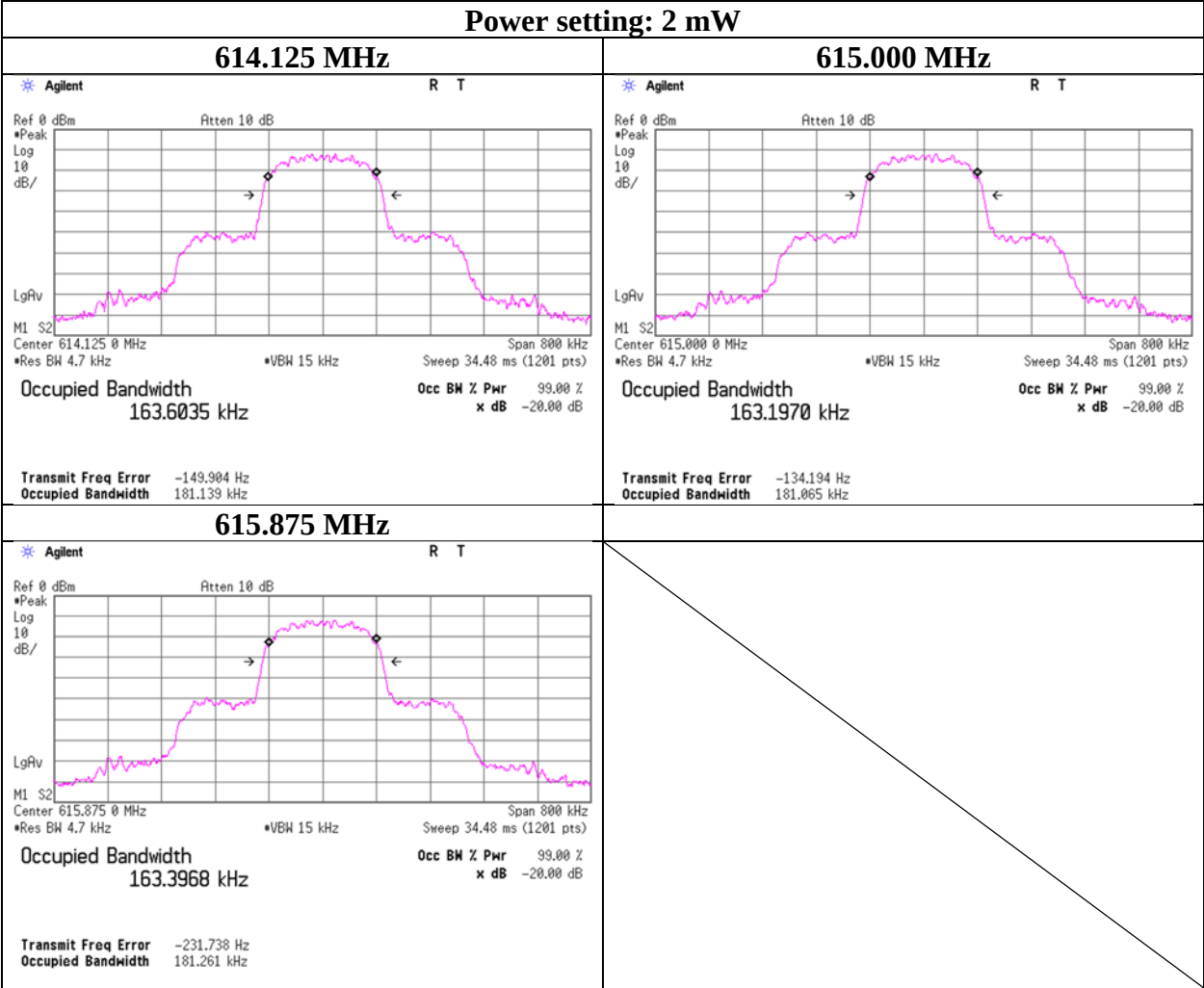
|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | July 26, 2022                      |
| Temperature / Humidity | 23 deg. C / 66 % RH                |
| Engineer               | Hiroki Numata                      |
| Mode                   | Tx 470.125 MHz to 607.875 MHz      |

Power setting: 25 mW



Emission Bandwidth

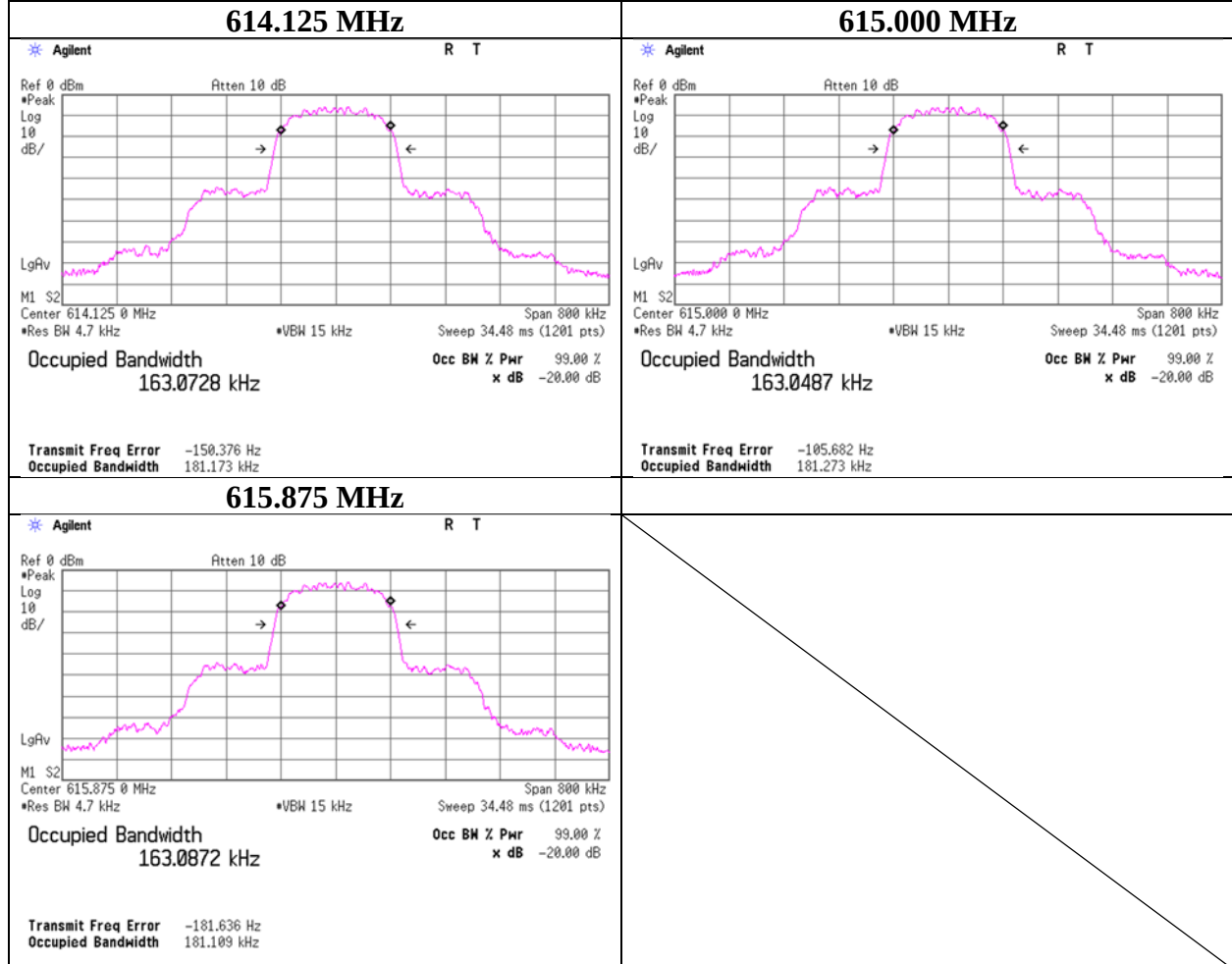
|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | July 26, 2022                      |
| Temperature / Humidity | 23 deg. C / 66 % RH                |
| Engineer               | Hiroki Numata                      |
| Mode                   | Tx 614.125 MHz to 615.875 MHz      |



## Emission Bandwidth

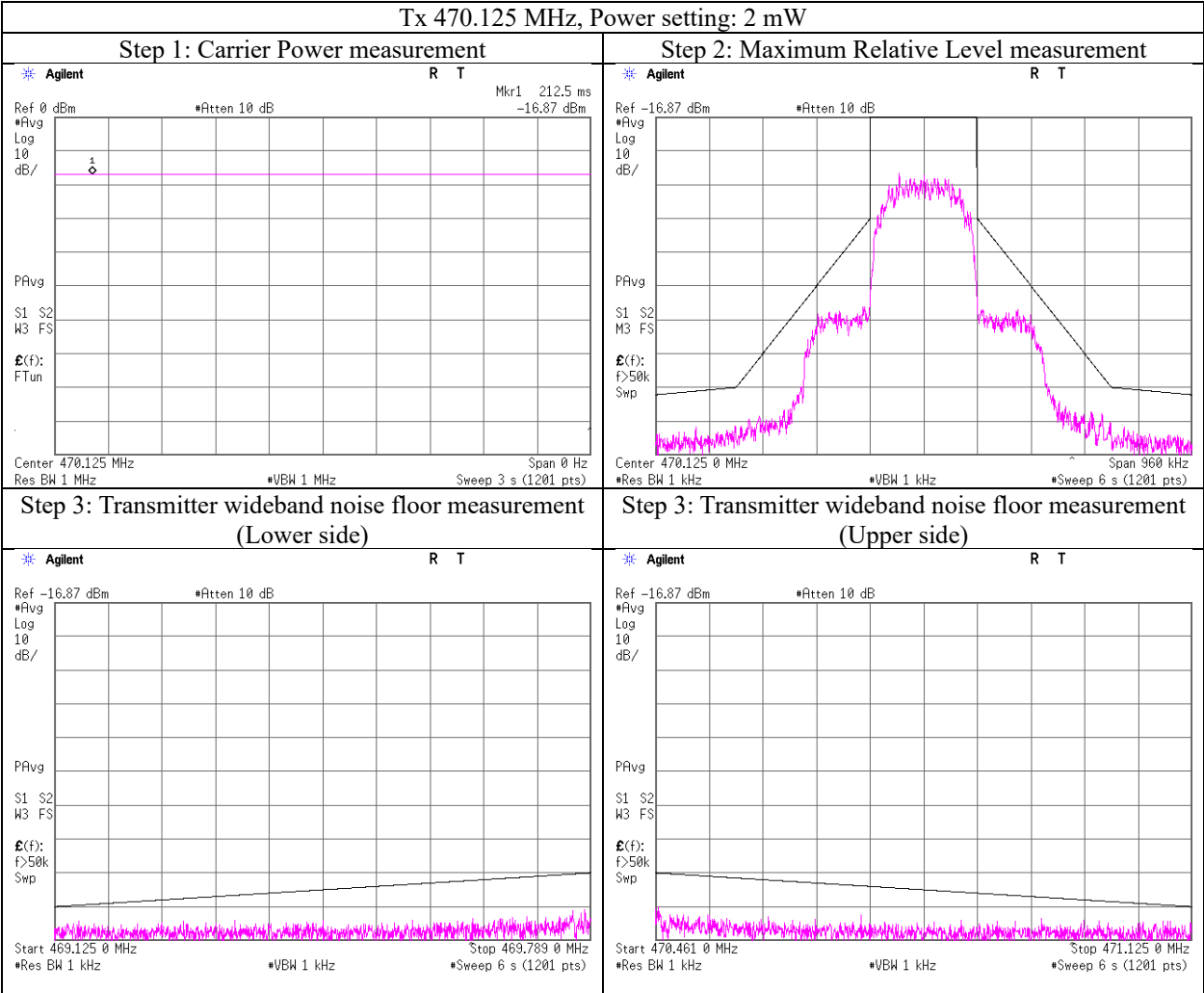
|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | July 26, 2022                      |
| Temperature / Humidity | 23 deg. C / 66 % RH                |
| Engineer               | Hiroki Numata                      |
| Mode                   | Tx 614.125 MHz to 615.875 MHz      |

### Power setting: 10 mW



Emission Mask

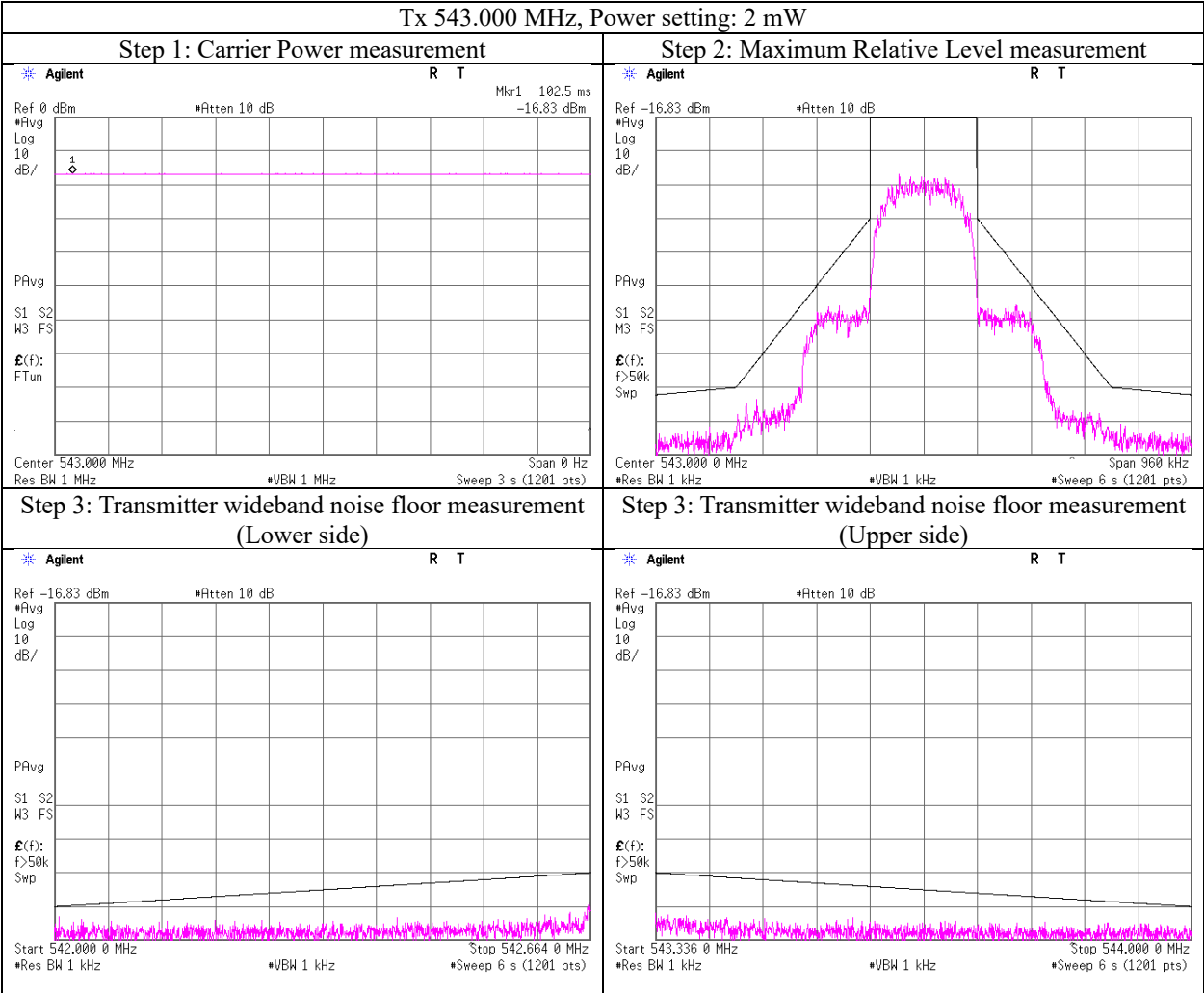
|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | July 28, 2022                      |
| Temperature / Humidity | 22 deg. C / 77 % RH                |
| Engineer               | Nachi Konegawa                     |
| Mode                   | Tx 470.125 MHz                     |



Emission Mask

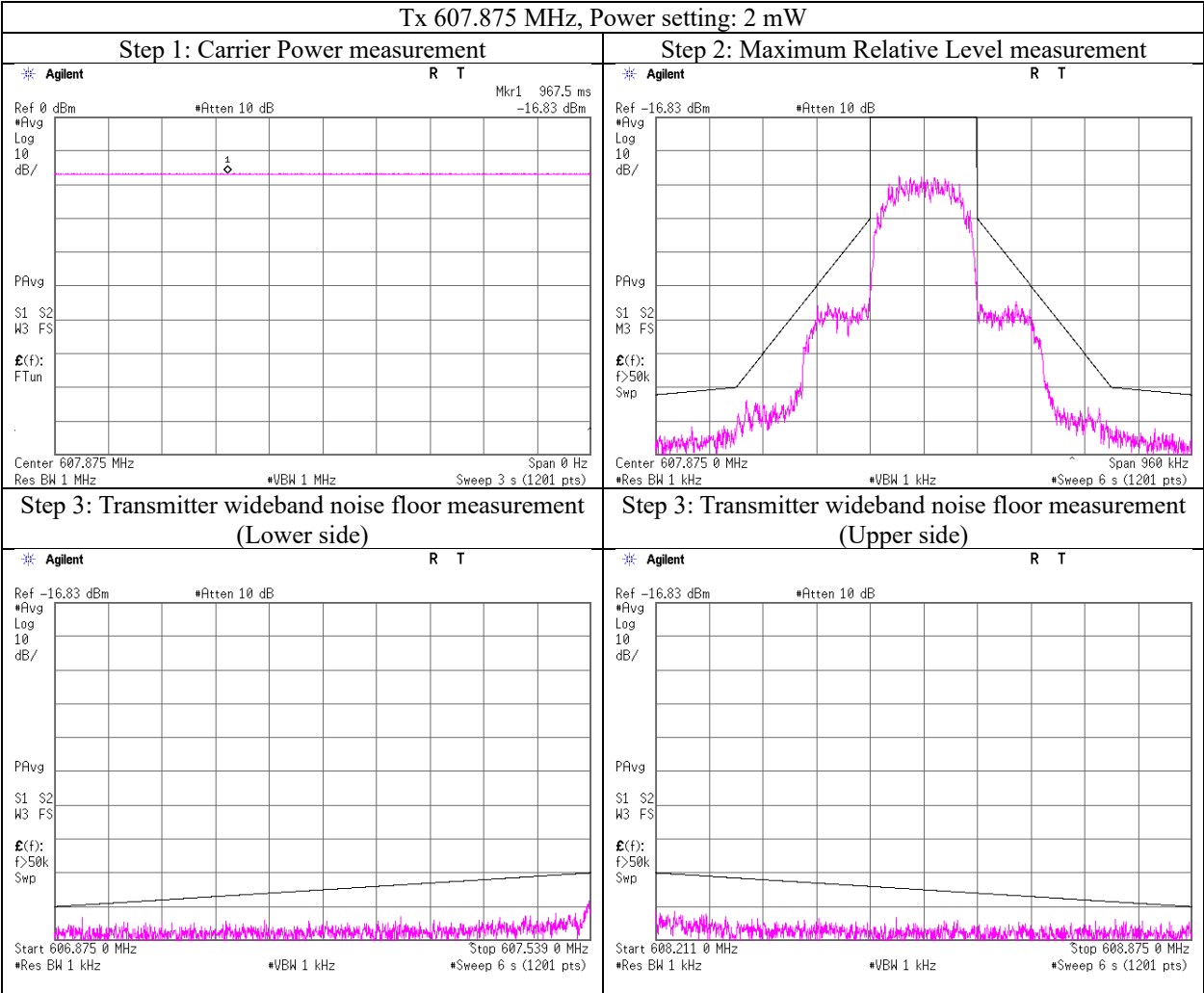
Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
July 28, 2022  
22 deg. C / 77 % RH  
Nachi Konegawa  
Tx 543.000 MHz



Emission Mask

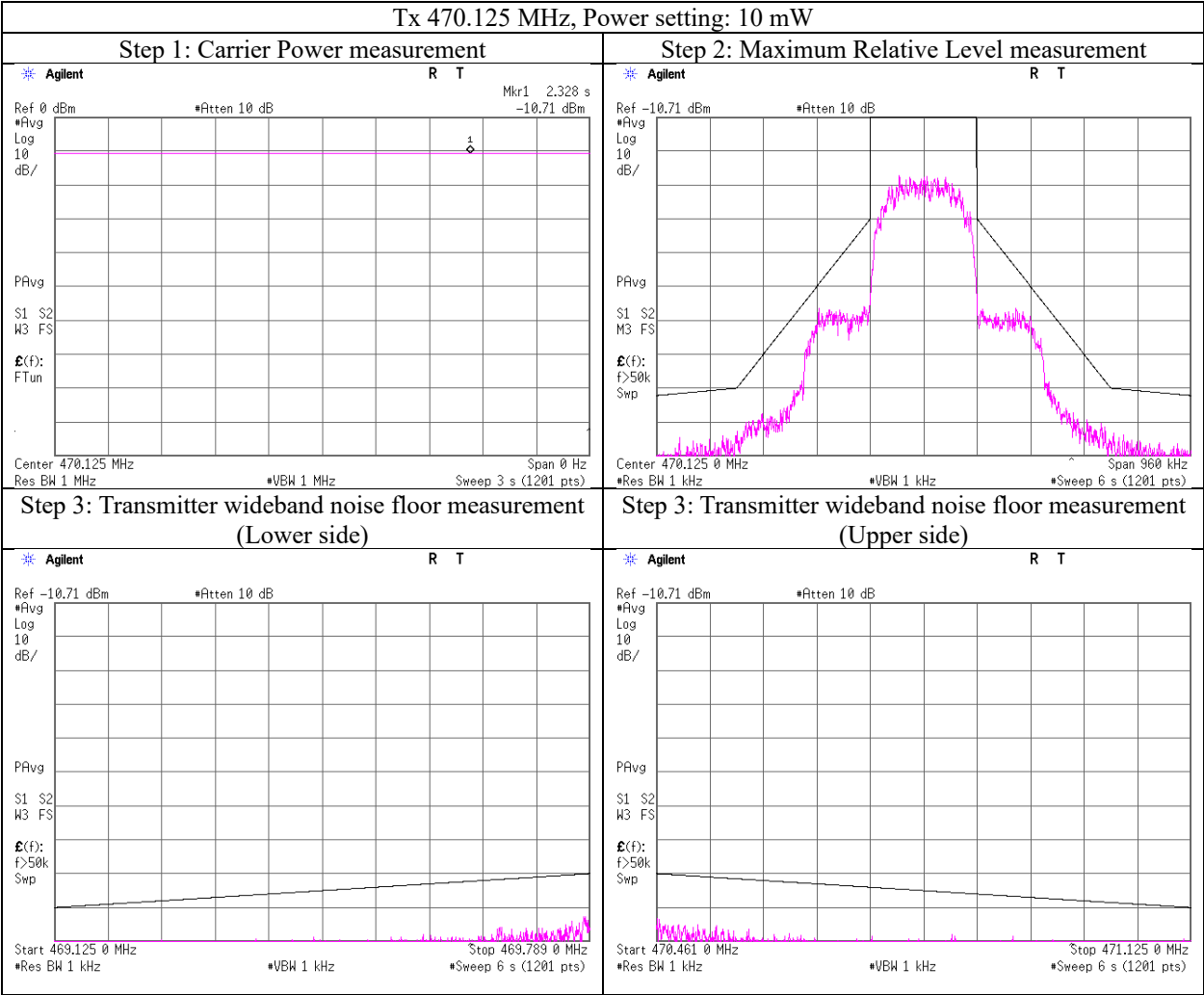
|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | July 28, 2022                      |
| Temperature / Humidity | 22 deg. C / 77 % RH                |
| Engineer               | Nachi Konegawa                     |
| Mode                   | Tx 607.875 MHz                     |



Emission Mask

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

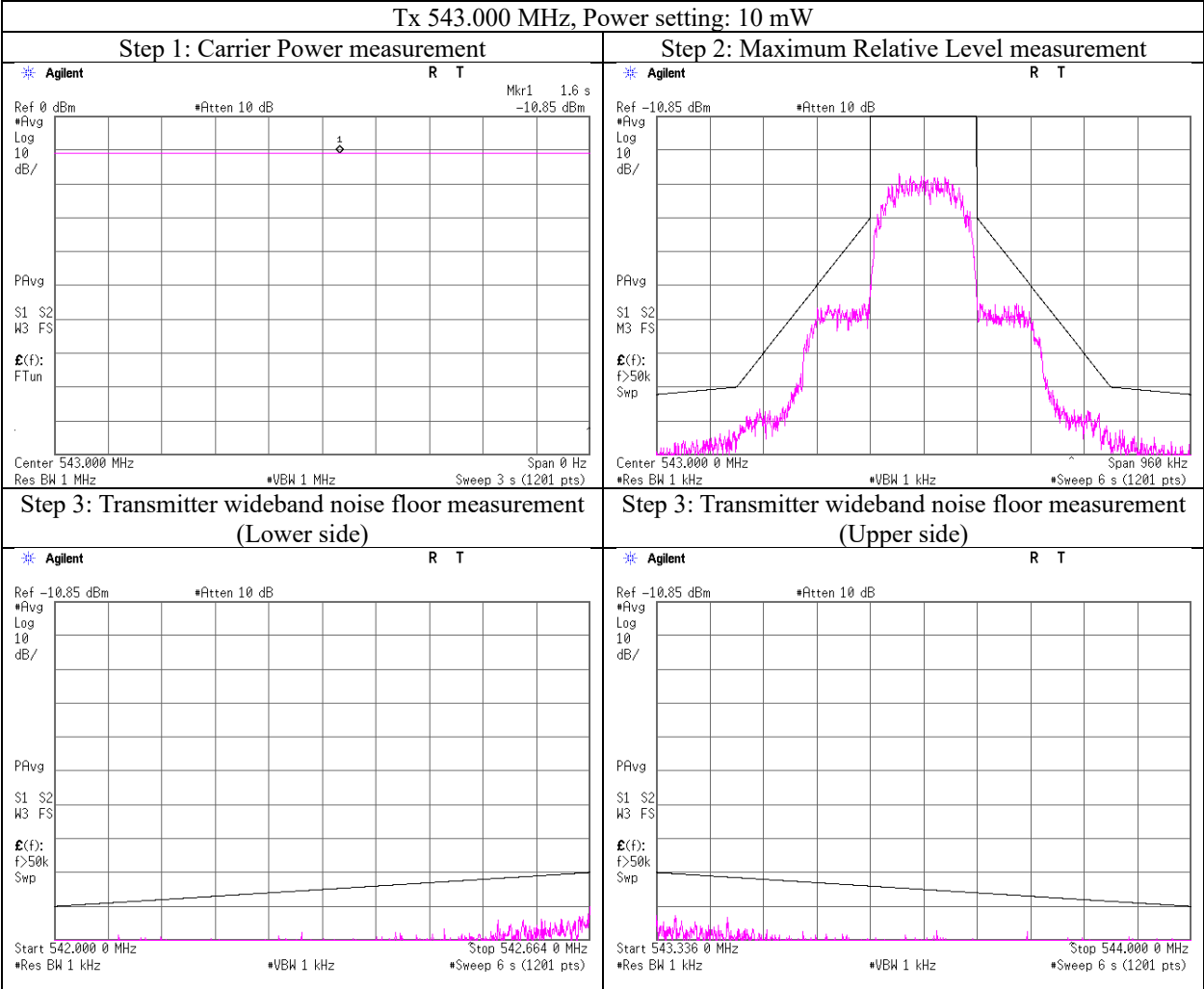
Ise EMC Lab. No.8 Measurement Room  
July 28, 2022  
22 deg. C / 77 % RH  
Nachi Konegawa  
Tx 470.125 MHz





Emission Mask

|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | July 28, 2022                      |
| Temperature / Humidity | 22 deg. C / 77 % RH                |
| Engineer               | Nachi Konegawa                     |
| Mode                   | Tx 543.000 MHz                     |



Emission Mask

Test place

Date

Temperature / Humidity

Engineer

Mode

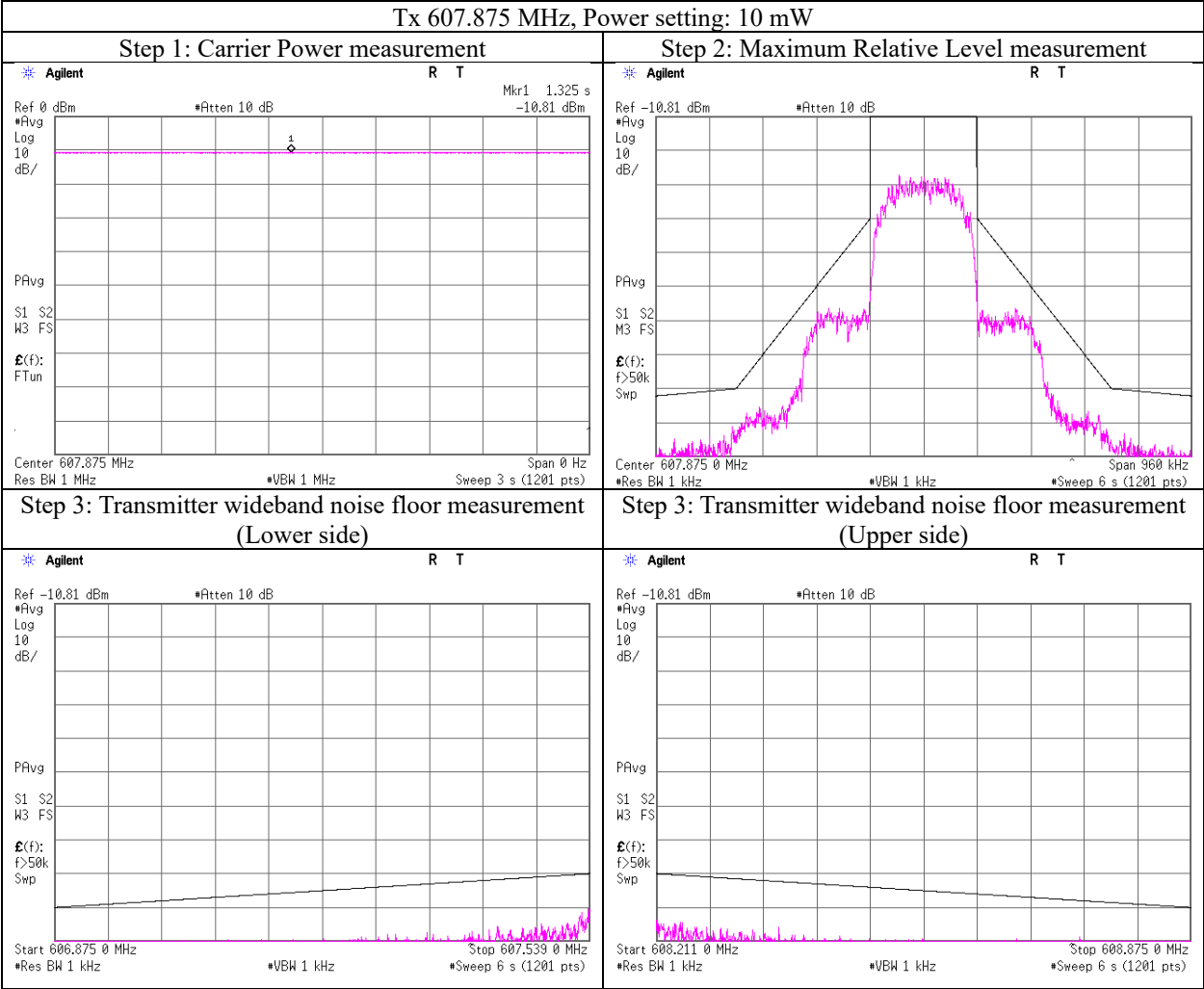
Ise EMC Lab. No.8 Measurement Room

July 28, 2022

22 deg. C / 77 % RH

Nachi Konegawa

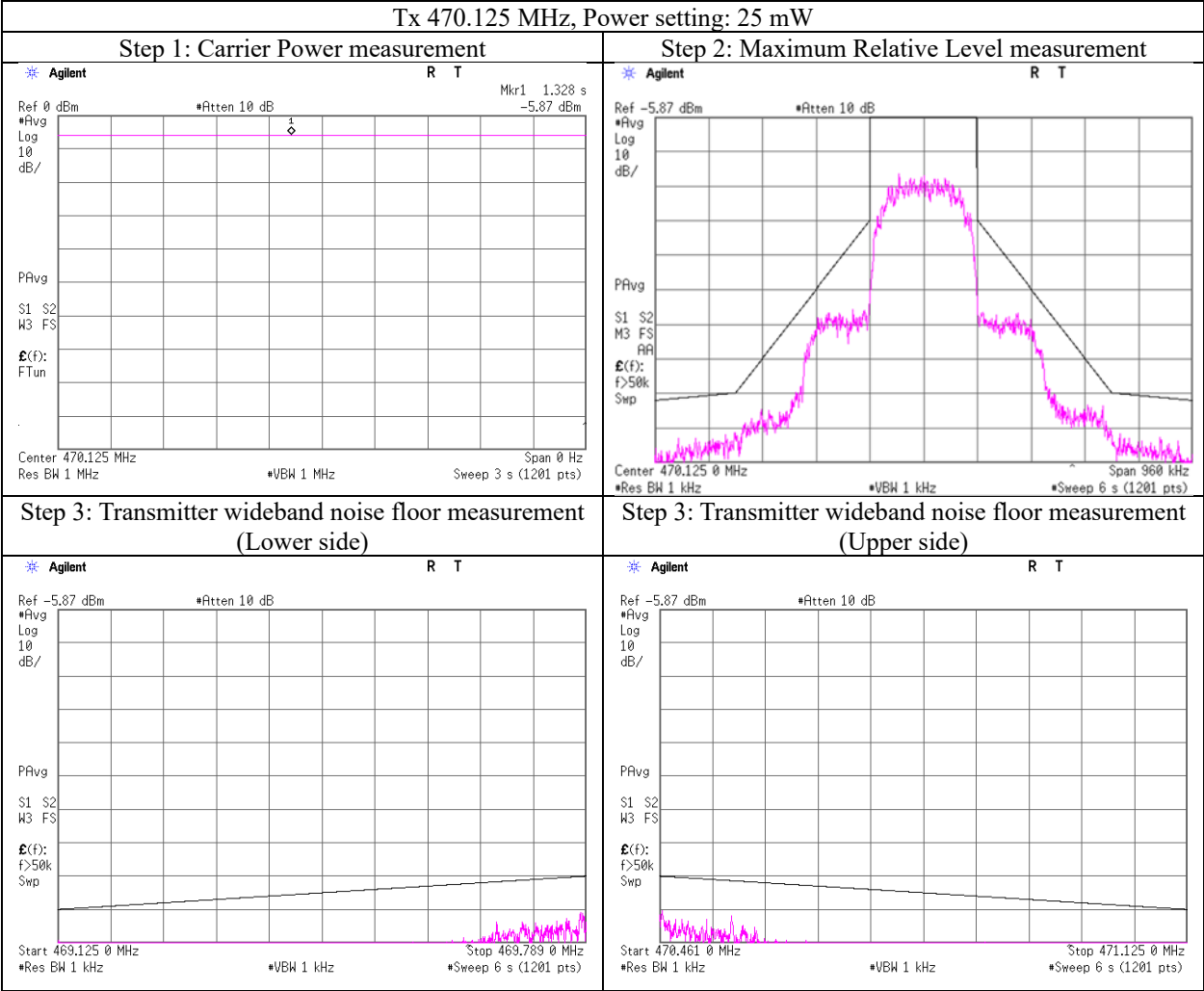
Tx 607.875 MHz



Emission Mask

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

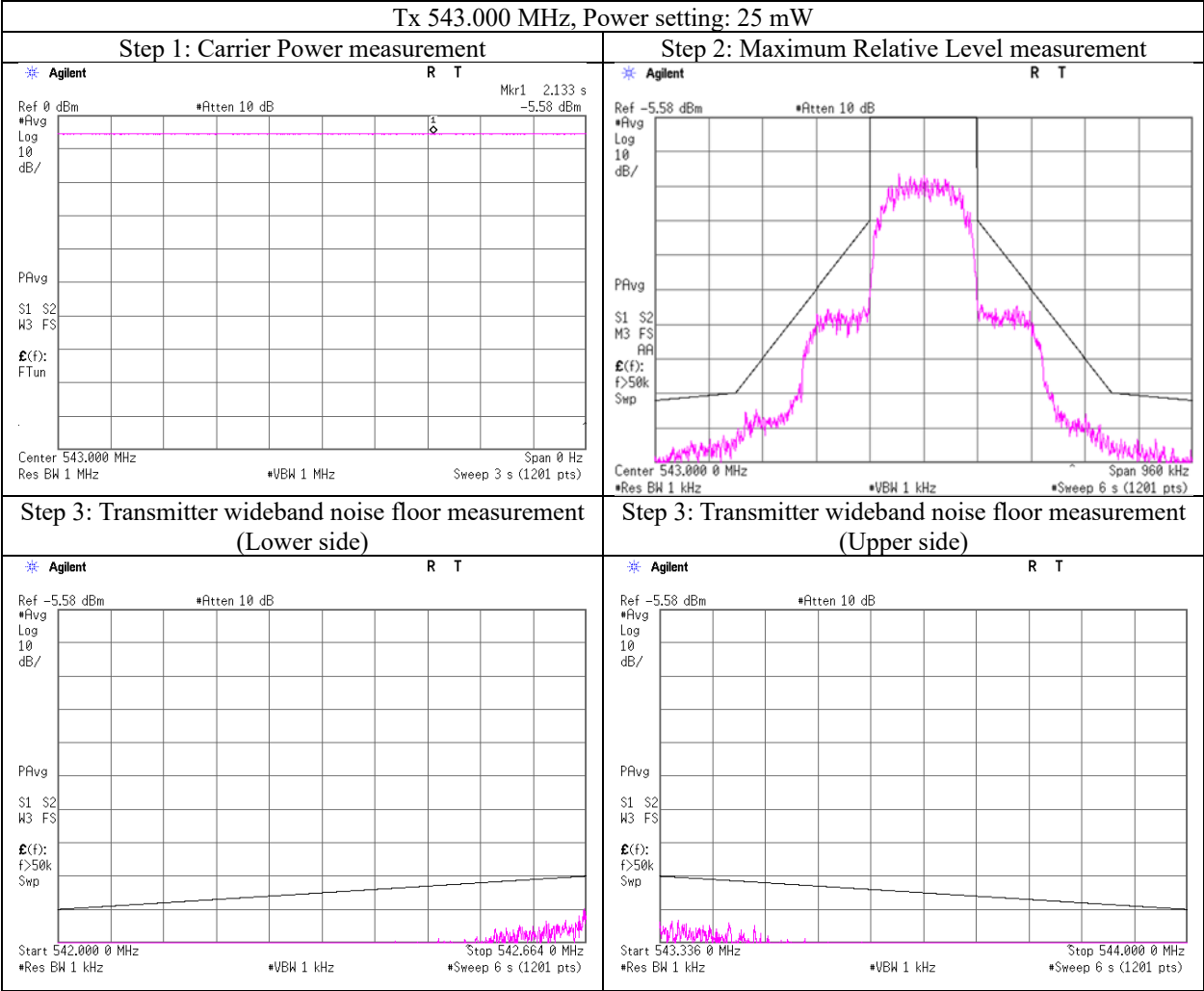
Ise EMC Lab. No.8 Measurement Room  
July 28, 2022  
22 deg. C / 77 % RH  
Nachi Konegawa  
Tx 470.125 MHz



Emission Mask

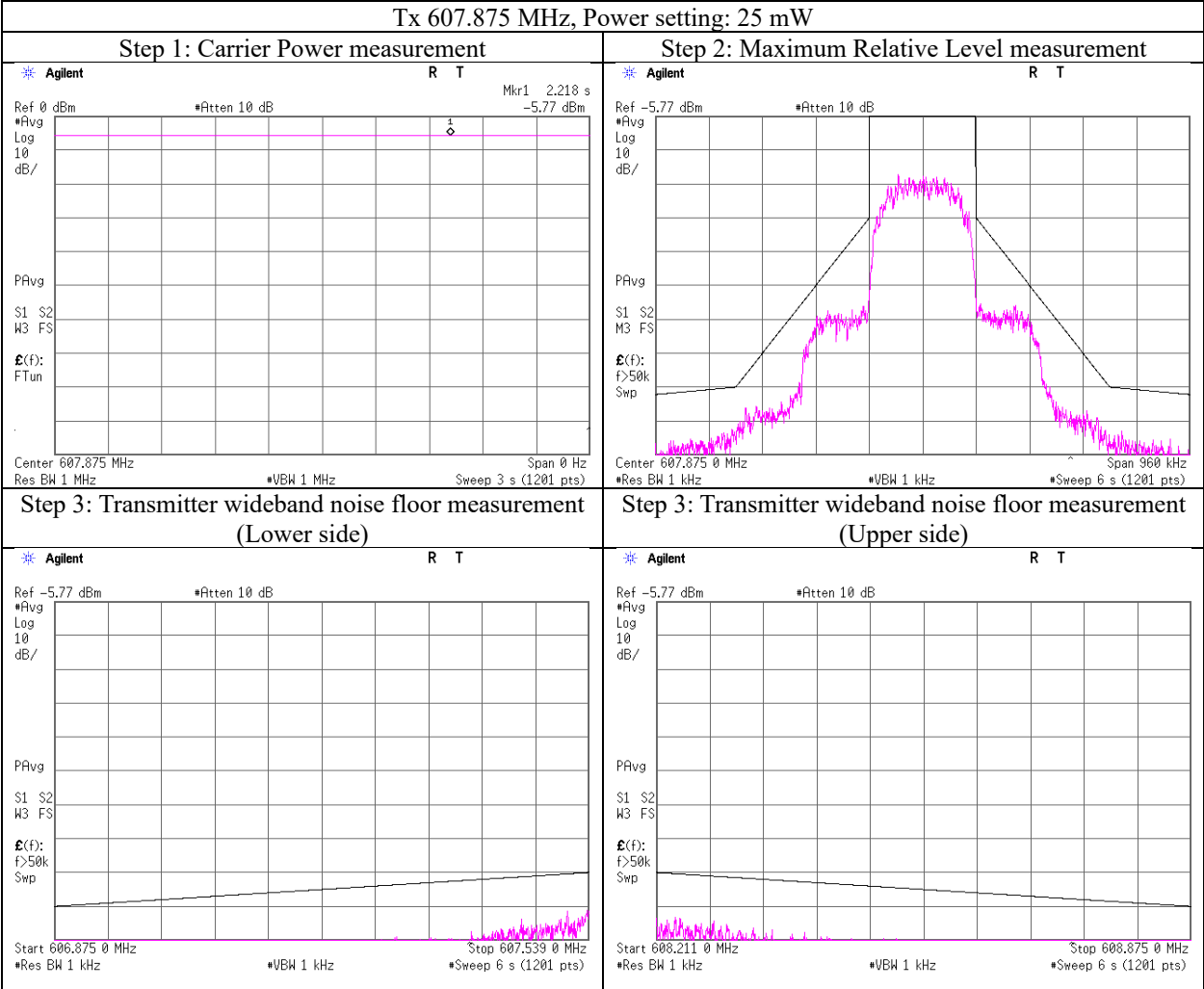
Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
July 28, 2022  
22 deg. C / 77 % RH  
Nachi Konegawa  
Tx 543.000 MHz



Emission Mask

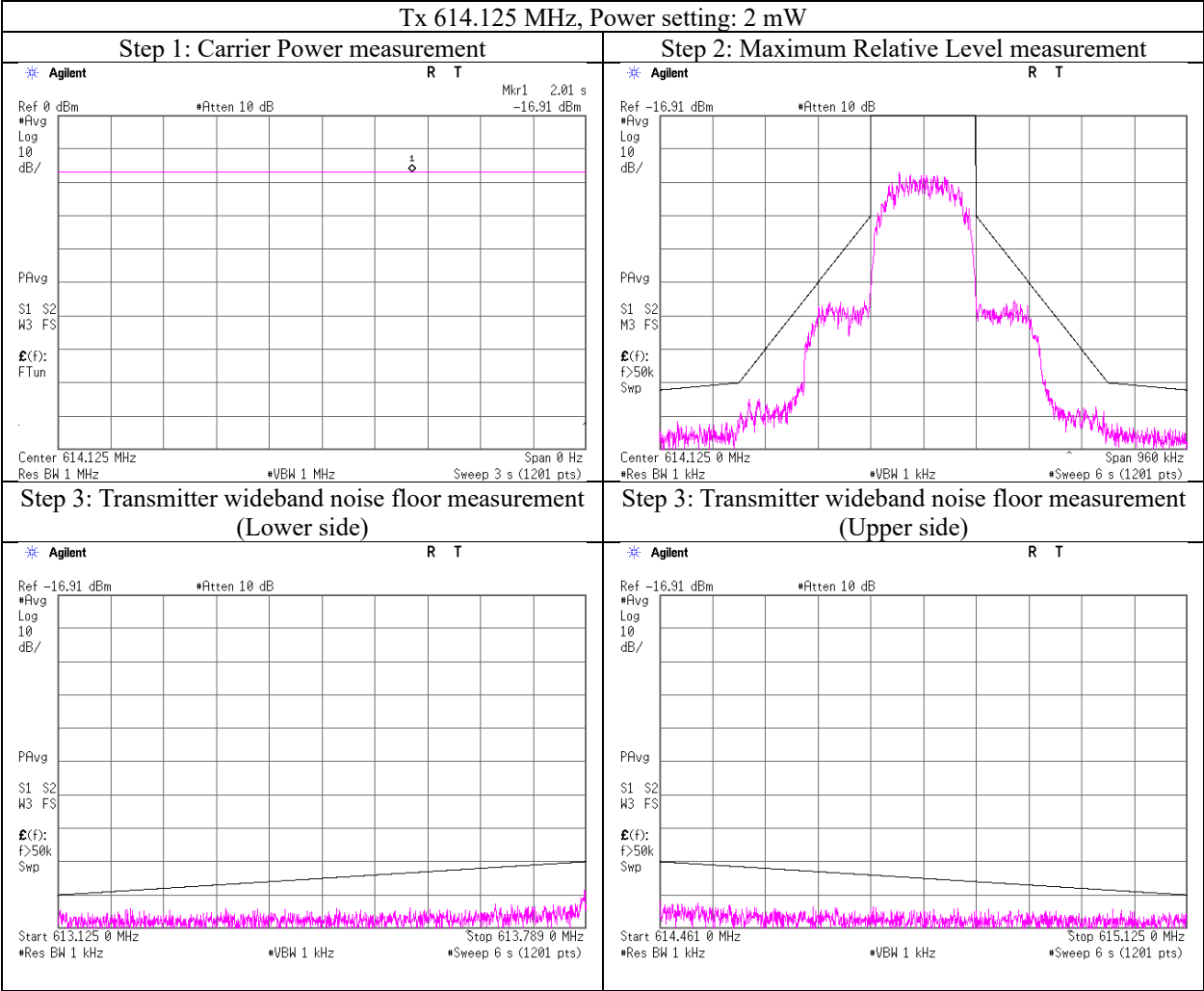
|                        |                                    |
|------------------------|------------------------------------|
| Test place             | Ise EMC Lab. No.8 Measurement Room |
| Date                   | July 28, 2022                      |
| Temperature / Humidity | 22 deg. C / 77 % RH                |
| Engineer               | Nachi Konegawa                     |
| Mode                   | Tx 607.875 MHz                     |



Emission Mask

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

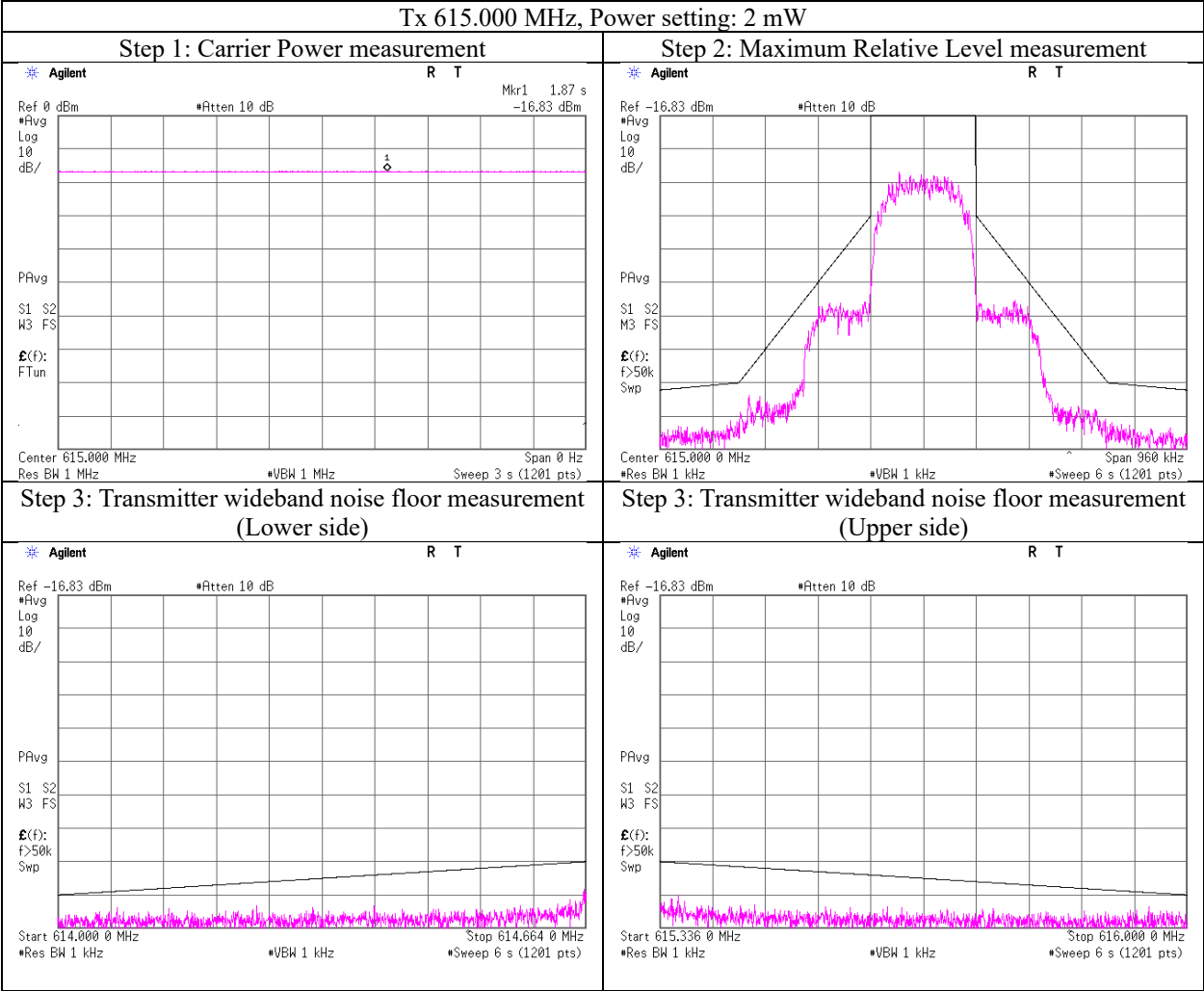
Ise EMC Lab. No.8 Measurement Room  
July 28, 2022  
22 deg. C / 77 % RH  
Nachi Konegawa  
Tx 614.125 MHz



Emission Mask

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

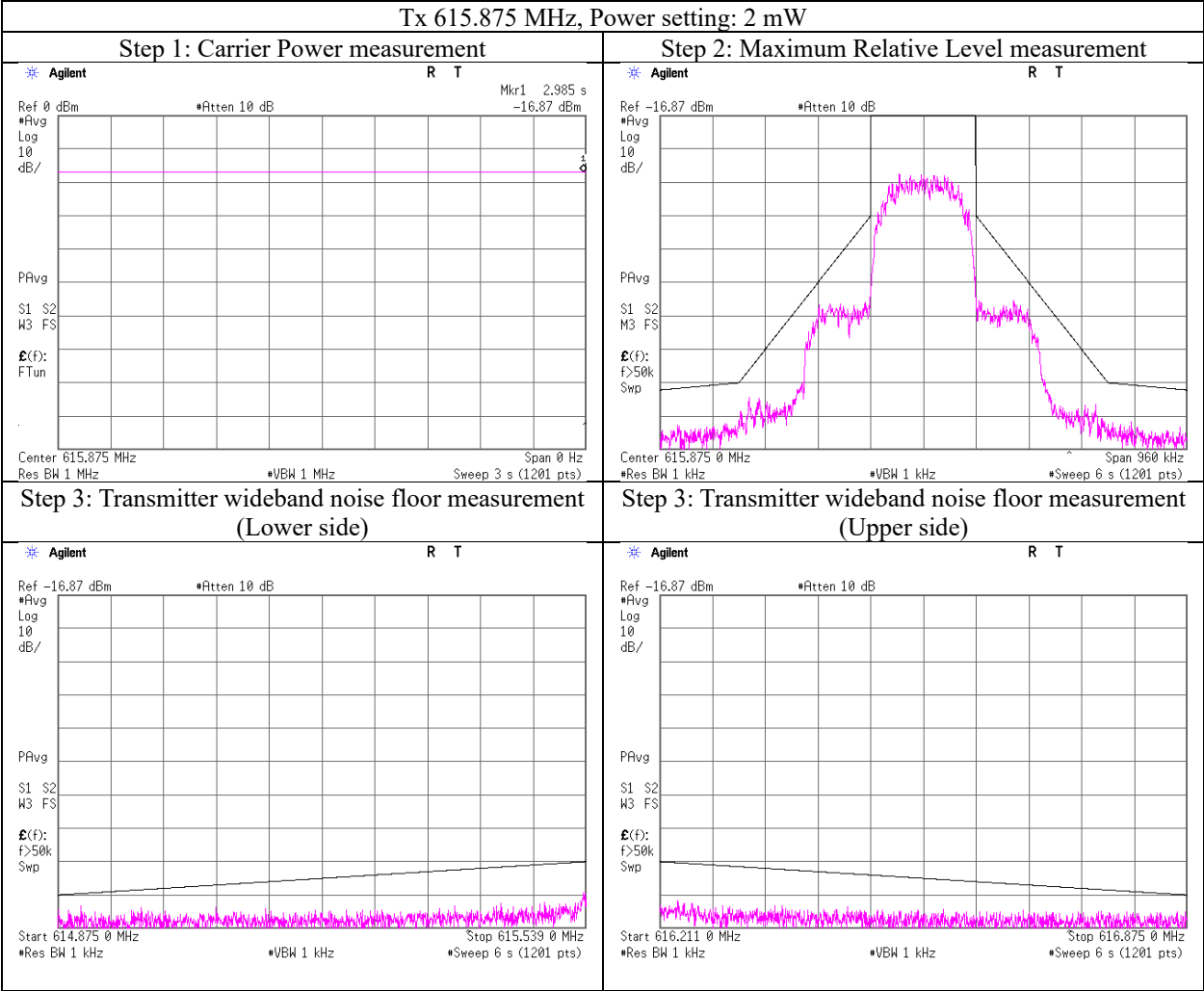
Ise EMC Lab. No.8 Measurement Room  
July 28, 2022  
22 deg. C / 77 % RH  
Nachi Konegawa  
Tx 615.000 MHz



Emission Mask

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
July 28, 2022  
22 deg. C / 77 % RH  
Nachi Konegawa  
Tx 615.875 MHz

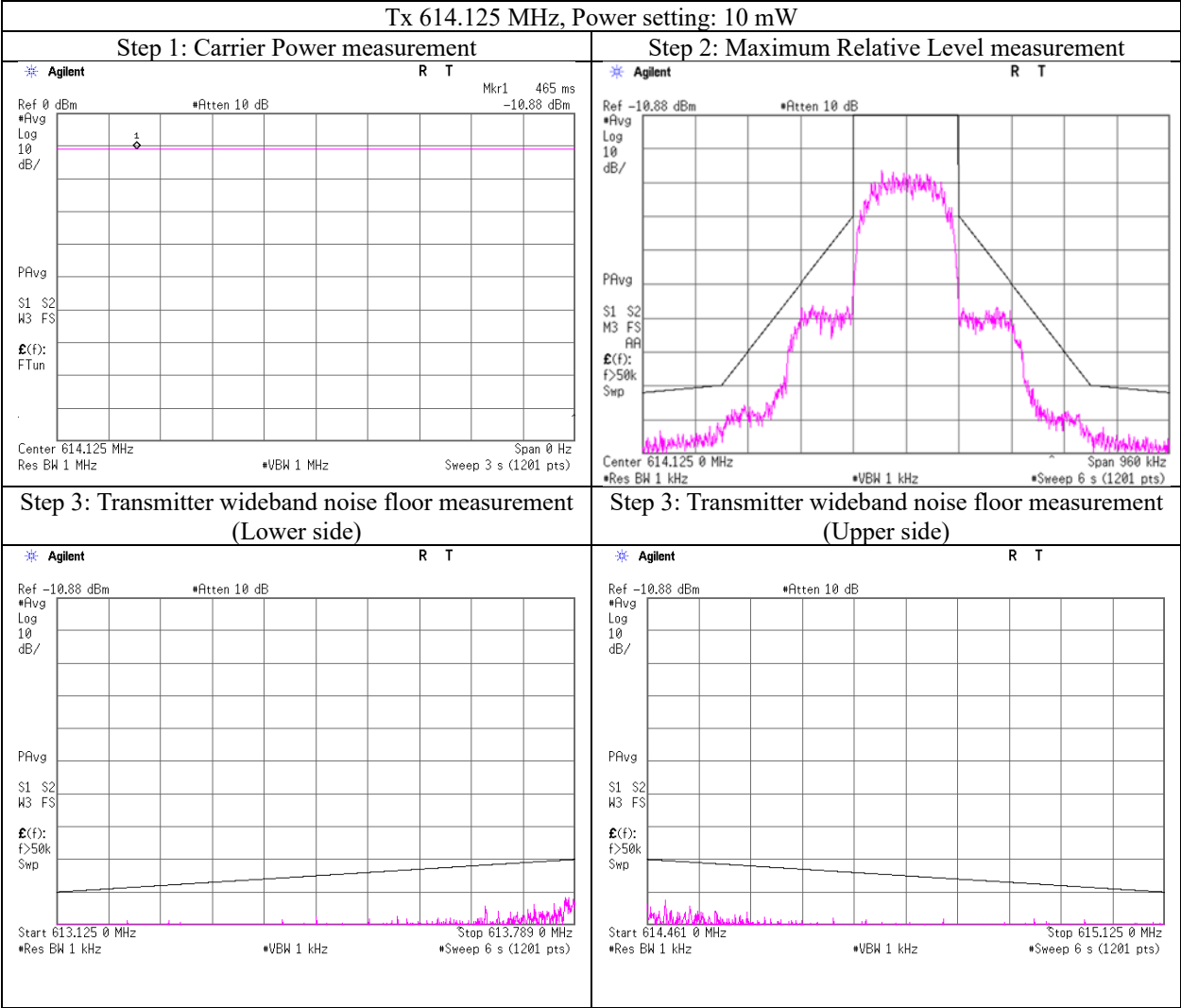




Emission Mask

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

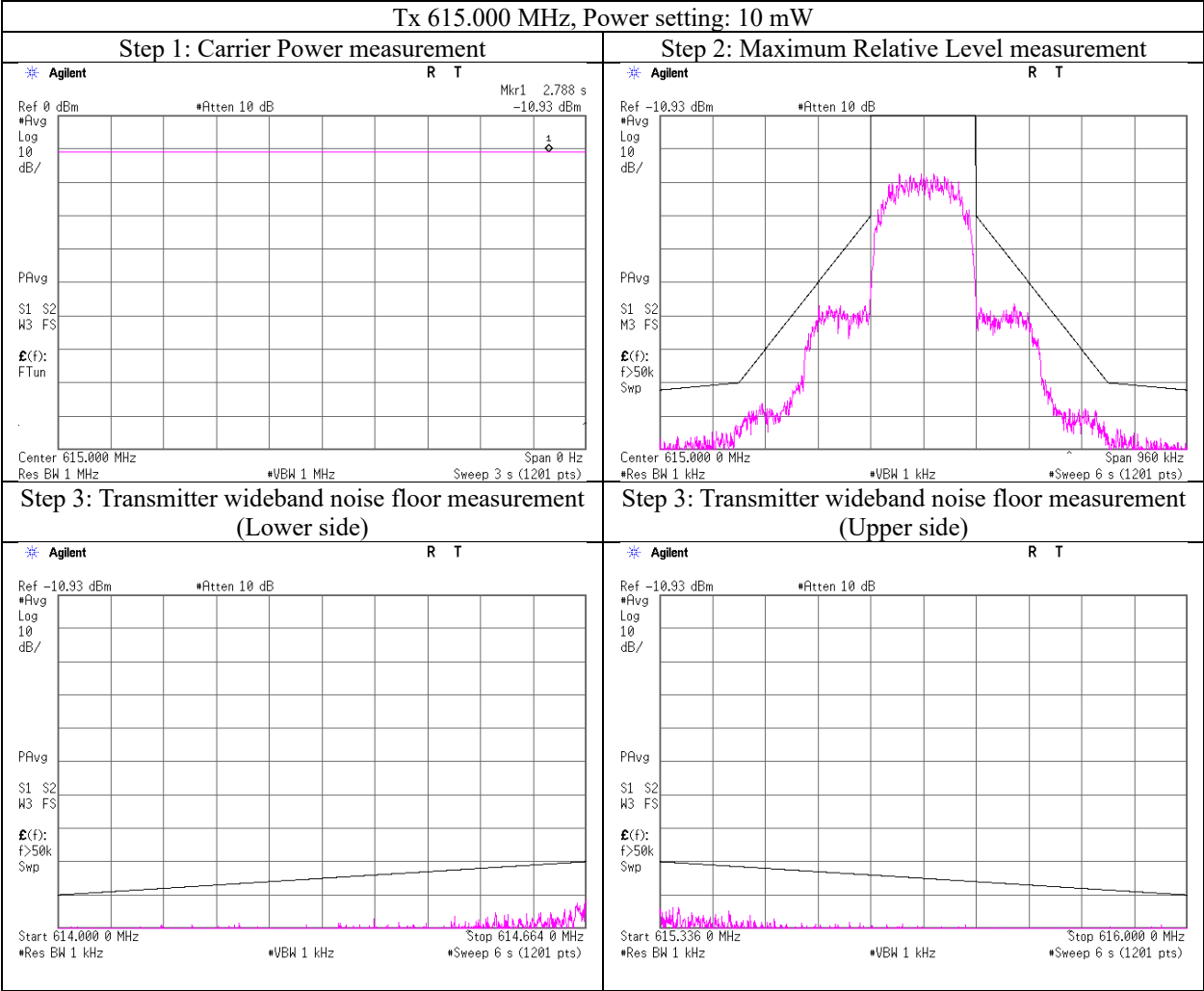
Ise EMC Lab. No.8 Measurement Room  
July 28, 2022  
22 deg. C / 77 % RH  
Nachi Konegawa  
Tx 614.125 MHz



Emission Mask

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

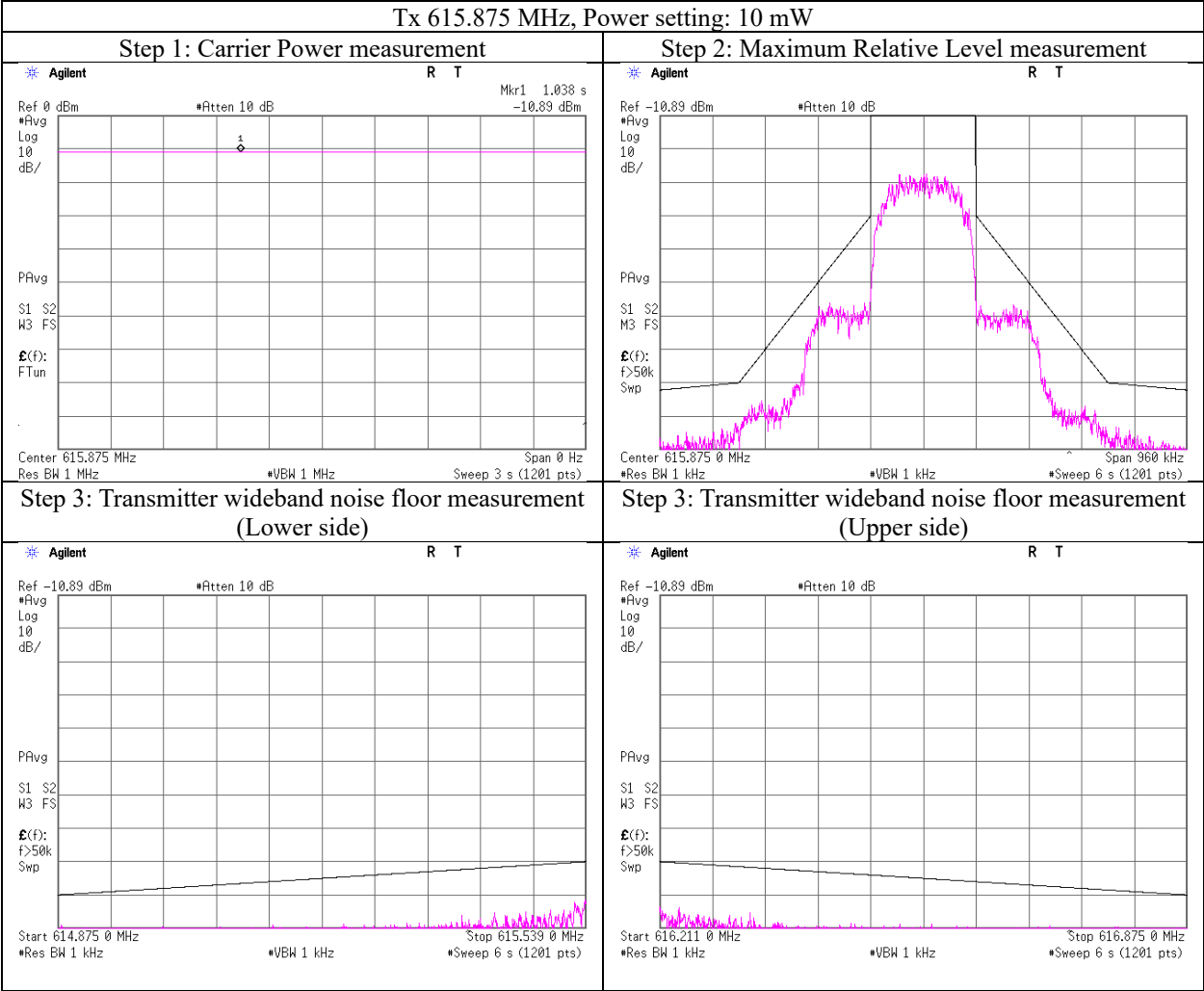
Ise EMC Lab. No.8 Measurement Room  
July 28, 2022  
22 deg. C / 77 % RH  
Nachi Konegawa  
Tx 615.000 MHz



Emission Mask

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
July 28, 2022  
22 deg. C / 77 % RH  
Nachi Konegawa  
Tx 615.875 MHz



## Transmitter unwanted emissions

|                        |                                 |                                 |
|------------------------|---------------------------------|---------------------------------|
| Test place             | Ise EMC Lab.                    | No.2                            |
| Semi Anechoic Chamber  | No.2                            | No.2                            |
| Date                   | July 27, 2022                   | July 29, 2022                   |
| Temperature / Humidity | 22 deg. C / 77 % RH             | 23 deg. C / 56 % RH             |
| Engineer               | Nachi Konegawa<br>(Below 1 GHz) | Takumi Nishida<br>(Above 1 GHz) |
| Mode                   | Tx 470.125 MHz                  |                                 |

| Frequency<br>[MHz] | Rx SA/TR          |       | Tx SG            |       | Tx<br>Cable<br>Loss<br>[dB] | Tx<br>Ant.<br>Gain<br>[dBi] | Result<br>(ERP)<br>[dBm] |       | Limit<br>(ERP)<br>[dBm] | Margin<br>[dB]            |                         | Horizontal                |                         | Vertical |     | Remarks |
|--------------------|-------------------|-------|------------------|-------|-----------------------------|-----------------------------|--------------------------|-------|-------------------------|---------------------------|-------------------------|---------------------------|-------------------------|----------|-----|---------|
|                    | Reading<br>[dBuV] |       | Reading<br>[dBm] |       |                             |                             |                          |       |                         | Rx Ant.<br>Height<br>[cm] | Turn<br>Table<br>[deg.] | Rx Ant.<br>Height<br>[cm] | Turn<br>Table<br>[deg.] |          |     |         |
|                    | Hori.             | Vert. | Hori.            | Vert. |                             |                             | Hori.                    | Vert. |                         |                           |                         |                           |                         |          |     |         |
| 47.501             | NS                | 37.9  | -                | -40.6 | 1.3                         | -32.8                       | -                        | -76.9 | -54.0                   | -                         | 22.9                    | -                         | -                       | 150      | 233 |         |
| 469.125            | 47.0              | 44.9  | -42.5            | -43.4 | 4.4                         | -8.0                        | -57.1                    | -58.0 | -36.0                   | 21.1                      | 22.0                    | 100                       | 94                      | 123      | 301 |         |
| 471.125            | 47.1              | 45.0  | -42.4            | -43.3 | 4.5                         | -8.0                        | -57.0                    | -57.9 | -54.0                   | 3.0                       | 3.9                     | 100                       | 94                      | 123      | 301 |         |
| 940.250            | 34.8              | 33.1  | -45.1            | -45.5 | 6.5                         | -8.7                        | -62.4                    | -62.8 | -36.0                   | 26.4                      | 26.8                    | 100                       | 219                     | 100      | 332 |         |
| 1410.375           | 57.8              | 57.6  | -51.5            | -51.7 | 2.9                         | 7.3                         | -49.1                    | -49.4 | -30.0                   | 19.1                      | 19.4                    | 139                       | 313                     | 107      | 19  |         |
| 1880.500           | 52.6              | 49.2  | -59.3            | -64.4 | 3.3                         | 10.2                        | -54.6                    | -59.6 | -30.0                   | 24.6                      | 29.6                    | 121                       | 27                      | 180      | 337 |         |
| 2350.625           | 48.7              | 47.4  | -64.7            | -65.7 | 3.7                         | 9.9                         | -60.6                    | -61.6 | -30.0                   | 30.6                      | 31.6                    | 125                       | 28                      | 244      | 351 |         |
| 2820.750           | NS                | NS    | -                | -     | -                           | -                           | -                        | -     | -30.0                   | -                         | -                       | -                         | -                       | -        | -   |         |
| 3290.875           | NS                | NS    | -                | -     | -                           | -                           | -                        | -     | -30.0                   | -                         | -                       | -                         | -                       | -        | -   |         |
| 3761.000           | NS                | NS    | -                | -     | -                           | -                           | -                        | -     | -30.0                   | -                         | -                       | -                         | -                       | -        | -   |         |
| 4231.125           | NS                | NS    | -                | -     | -                           | -                           | -                        | -     | -30.0                   | -                         | -                       | -                         | -                       | -        | -   |         |
| 4701.250           | NS                | NS    | -                | -     | -                           | -                           | -                        | -     | -30.0                   | -                         | -                       | -                         | -                       | -        | -   |         |

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - 2.15,

Rx-ANTENNA : Biconical Antenna(25 MHz - 200 MHz), Logperiodic Antenna(200 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Tx-ANTENNA : 120 MHz tuned Dipole Antenna(30 MHz - 120 MHz), Dipole Antenna(120 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

NS : No signal detect.

Detector : Below 1 GHz: Test Receiver QP (RBW: 120 kHz)

Above 1 GHz: Spectrum Analyzer RMS Average (RBW: 1 MHz / VBW: 3 MHz)

## Transmitter unwanted emissions

|                        |                     |                     |
|------------------------|---------------------|---------------------|
| Test place             | Ise EMC Lab.        |                     |
| Semi Anechoic Chamber  | No.2                | No.2                |
| Date                   | July 27, 2022       | July 29, 2022       |
| Temperature / Humidity | 22 deg. C / 77 % RH | 23 deg. C / 56 % RH |
| Engineer               | Nachi Konegawa      | Takumi Nishida      |
|                        | (Below 1 GHz)       | (Above 1 GHz)       |
| Mode                   | Tx 543.000 MHz      |                     |

| Frequency<br>[MHz] | Rx SA/TR          |       | Tx SG            |       | Tx                    | Tx                    | Result         |       | Limit<br>(ERP)<br>[dBm] | Margin         |       | Horizontal |                           | Vertical                |                           | Remarks |                         |
|--------------------|-------------------|-------|------------------|-------|-----------------------|-----------------------|----------------|-------|-------------------------|----------------|-------|------------|---------------------------|-------------------------|---------------------------|---------|-------------------------|
|                    | Reading<br>[dBuV] |       | Reading<br>[dBm] |       | Cable<br>Loss<br>[dB] | Ant.<br>Gain<br>[dBi] | (ERP)<br>[dBm] |       |                         | (ERP)<br>[dBm] | [dB]  |            | Rx Ant.<br>Height<br>[cm] | Turn<br>Table<br>[deg.] | Rx Ant.<br>Height<br>[cm] |         | Turn<br>Table<br>[deg.] |
|                    | Hori.             | Vert. | Hori.            | Vert. |                       |                       | Hori.          | Vert. |                         |                | Hori. | Vert.      |                           |                         |                           |         |                         |
| 47.198             | NS                | 37.5  | -                | -41.0 | 1.3                   | -33.0                 | -              | -77.4 | -54.0                   | -              | 23.4  | -          | -                         | 150                     | 246                       |         |                         |
| 542.000            | 45.1              | 42.4  | -43.0            | -43.7 | 4.8                   | -8.1                  | -58.0          | -58.7 | -54.0                   | 4.0            | 4.7   | 161        | 280                       | 107                     | 235                       |         |                         |
| 544.000            | 45.2              | 42.6  | -42.9            | -43.5 | 4.8                   | -8.1                  | -57.9          | -58.5 | -54.0                   | 3.9            | 4.5   | 161        | 280                       | 107                     | 235                       |         |                         |
| 1086.000           | 51.8              | 51.5  | -58.5            | -59.2 | 2.5                   | 6.1                   | -57.0          | -57.7 | -30.0                   | 27.0           | 27.7  | 151        | 124                       | 106                     | 331                       |         |                         |
| 1629.000           | 57.4              | 55.4  | -53.5            | -55.8 | 3.1                   | 9.5                   | -49.2          | -51.5 | -30.0                   | 19.2           | 21.5  | 165        | 310                       | 110                     | 300                       |         |                         |
| 2172.000           | 50.0              | 47.7  | -59.1            | -59.5 | 3.5                   | 9.1                   | -55.6          | -56.0 | -30.0                   | 25.6           | 26.0  | 104        | 28                        | 115                     | 19                        |         |                         |
| 2715.000           | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0                   | -              | -     | -          | -                         | -                       | -                         |         |                         |
| 3258.000           | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0                   | -              | -     | -          | -                         | -                       | -                         |         |                         |
| 3801.000           | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0                   | -              | -     | -          | -                         | -                       | -                         |         |                         |
| 4344.000           | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0                   | -              | -     | -          | -                         | -                       | -                         |         |                         |
| 4887.000           | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0                   | -              | -     | -          | -                         | -                       | -                         |         |                         |
| 5430.000           | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0                   | -              | -     | -          | -                         | -                       | -                         |         |                         |

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - 2.15,

Rx-ANTENNA : Biconical Antenna(25 MHz - 200 MHz), Logperiodic Antenna(200 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Tx-ANTENNA : 120 MHz tuned Dipole Antenna(30 MHz - 120 MHz), Dipole Antenna(120 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

NS : No signal detect.

Detector : Below 1 GHz: Test Receiver QP (RBW: 120 kHz)

Above 1 GHz: Spectrum Analyzer RMS Average (RBW: 1 MHz / VBW: 3 MHz)

## Transmitter unwanted emissions

|                        |                     |                     |
|------------------------|---------------------|---------------------|
| Test place             | Ise EMC Lab.        |                     |
| Semi Anechoic Chamber  | No.2                | No.2                |
| Date                   | July 27, 2022       | July 29, 2022       |
| Temperature / Humidity | 22 deg. C / 77 % RH | 23 deg. C / 56 % RH |
| Engineer               | Nachi Konegawa      | Takumi Nishida      |
|                        | (Below 1 GHz)       | (Above 1 GHz)       |
| Mode                   | Tx 607.875 MHz      |                     |

| Frequency | Rx SA/TR       |       | Tx SG         |       | Tx              | Tx              | Result      |       | Limit | Margin      |       | Horizontal          |                   | Vertical            |                   | Remarks |
|-----------|----------------|-------|---------------|-------|-----------------|-----------------|-------------|-------|-------|-------------|-------|---------------------|-------------------|---------------------|-------------------|---------|
|           | Reading [dBuV] |       | Reading [dBm] |       | Cable Loss [dB] | Ant. Gain [dBi] | (ERP) [dBm] |       |       | (ERP) [dBm] | [dB]  | Rx Ant. Height [cm] | Turn Table [deg.] | Rx Ant. Height [cm] | Turn Table [deg.] |         |
|           | Hori.          | Vert. | Hori.         | Vert. |                 |                 | Hori.       | Vert. |       |             |       |                     |                   |                     |                   |         |
| [MHz]     | Hori.          | Vert. | Hori.         | Vert. |                 |                 | Hori.       | Vert. |       | Hori.       | Vert. |                     |                   |                     |                   |         |
| 48.057    | NS             | 38.0  | -             | -40.5 | 1.3             | -32.6           | -           | -76.6 | -54.0 | -           | 22.6  | -                   | -                 | 150                 | 93                |         |
| 606.875   | 43.8           | 40.5  | -42.6         | -42.4 | 5.1             | -8.0            | -57.8       | -57.6 | -54.0 | 3.8         | 3.6   | 137                 | 283               | 211                 | 278               |         |
| 608.875   | 43.1           | 39.9  | -43.3         | -43.0 | 5.1             | -8.0            | -58.5       | -58.2 | -54.0 | 4.5         | 4.2   | 137                 | 283               | 211                 | 278               |         |
| 1215.750  | 51.3           | 50.0  | -59.1         | -60.4 | 2.7             | 6.4             | -57.5       | -58.8 | -30.0 | 27.5        | 28.8  | 106                 | 242               | 107                 | 172               |         |
| 1823.625  | 60.3           | 58.2  | -48.7         | -51.5 | 3.2             | 10.1            | -44.0       | -46.8 | -30.0 | 14.0        | 16.8  | 105                 | 22                | 219                 | 22                |         |
| 2431.500  | 50.0           | 48.3  | -60.1         | -60.5 | 3.7             | 10.4            | -55.6       | -55.9 | -30.0 | 25.6        | 25.9  | 108                 | 22                | 232                 | 356               |         |
| 3039.375  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0 | -           | -     | -                   | -                 | -                   | -                 |         |
| 3647.250  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0 | -           | -     | -                   | -                 | -                   | -                 |         |
| 4255.125  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0 | -           | -     | -                   | -                 | -                   | -                 |         |
| 4863.000  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0 | -           | -     | -                   | -                 | -                   | -                 |         |
| 5470.875  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0 | -           | -     | -                   | -                 | -                   | -                 |         |
| 6078.750  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0 | -           | -     | -                   | -                 | -                   | -                 |         |

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - 2.15,

Rx-ANTENNA : Biconical Antenna(25 MHz - 200 MHz), Logperiodic Antenna(200 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Tx-ANTENNA : 120 MHz tuned Dipole Antenna(30 MHz - 120 MHz), Dipole Antenna(120 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

NS : No signal detect.

Detector : Below 1 GHz: Test Receiver QP (RBW: 120 kHz)

Above 1 GHz: Spectrum Analyzer RMS Average (RBW: 1 MHz / VBW: 3 MHz)

## Transmitter unwanted emissions

|                        |                     |                     |
|------------------------|---------------------|---------------------|
| Test place             | Ise EMC Lab.        | No.2                |
| Semi Anechoic Chamber  | No.2                | No.2                |
| Date                   | July 27, 2022       | July 29, 2022       |
| Temperature / Humidity | 22 deg. C / 77 % RH | 23 deg. C / 56 % RH |
| Engineer               | Nachi Konegawa      | Takumi Nishida      |
|                        | (Below 1 GHz)       | (Above 1 GHz)       |
| Mode                   | Tx 614.125 MHz      |                     |

| Frequency | Rx SA/TR       |       | Tx SG         |       | Tx              | Tx              | Result      |       | Limit        | Margin |                     | Horizontal        |                     | Vertical          |       | Remarks |
|-----------|----------------|-------|---------------|-------|-----------------|-----------------|-------------|-------|--------------|--------|---------------------|-------------------|---------------------|-------------------|-------|---------|
|           | Reading [dBuV] |       | Reading [dBm] |       | Cable Loss [dB] | Ant. Gain [dBi] | (ERP) [dBm] |       | (ERP) [dBmV] | [dB]   | Rx Ant. Height [cm] | Turn Table [deg.] | Rx Ant. Height [cm] | Turn Table [deg.] |       |         |
|           | Hori.          | Vert. | Hori.         | Vert. |                 |                 | Hori.       | Vert. |              |        |                     |                   |                     |                   | Hori. |         |
| [MHz]     |                |       |               |       |                 |                 |             |       |              |        |                     |                   |                     |                   |       |         |
| 48.364    | NS             | 38.7  | -             | -39.8 | 1.3             | -32.4           | -           | -75.7 | -54.0        | -      | 21.7                | -                 | -                   | 150               | 191   |         |
| 613.125   | 38.0           | 35.0  | -48.4         | -48.6 | 5.1             | -8.0            | -63.6       | -63.8 | -54.0        | 9.6    | 9.8                 | 134               | 61                  | 209               | 182   |         |
| 615.125   | 38.1           | 35.2  | -48.3         | -48.4 | 5.1             | -8.0            | -63.5       | -63.6 | -54.0        | 9.5    | 9.6                 | 134               | 61                  | 209               | 182   |         |
| 1228.250  | 50.9           | 49.5  | -59.4         | -60.3 | 2.7             | 6.4             | -57.8       | -58.7 | -30.0        | 27.8   | 28.7                | 102               | 228                 | 108               | 178   |         |
| 1842.375  | 65.8           | 64.3  | -42.9         | -45.0 | 3.3             | 10.1            | -38.2       | -40.2 | -30.0        | 8.2    | 10.2                | 150               | 30                  | 216               | 18    |         |
| 2456.500  | 59.3           | 55.8  | -48.7         | -51.0 | 3.8             | 10.6            | -44.1       | -46.3 | -30.0        | 14.1   | 16.3                | 105               | 29                  | 168               | 350   |         |
| 3070.625  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0        | -      | -                   | -                 | -                   | -                 | -     |         |
| 3684.750  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0        | -      | -                   | -                 | -                   | -                 | -     |         |
| 4298.875  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0        | -      | -                   | -                 | -                   | -                 | -     |         |
| 4913.000  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0        | -      | -                   | -                 | -                   | -                 | -     |         |
| 5527.125  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0        | -      | -                   | -                 | -                   | -                 | -     |         |
| 6141.250  | NS             | NS    | -             | -     | -               | -               | -           | -     | -30.0        | -      | -                   | -                 | -                   | -                 | -     |         |

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - 2.15,

Rx-ANTENNA : Biconical Antenna(25 MHz - 200 MHz), Logperiodic Antenna(200 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Tx-ANTENNA : 120 MHz tuned Dipole Antenna(30 MHz - 120 MHz), Dipole Antenna(120 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

NS : No signal detect.

Detector : Below 1 GHz: Test Receiver QP (RBW: 120 kHz)

Above 1 GHz: Spectrum Analyzer RMS Average (RBW: 1 MHz / VBW: 3 MHz)

## Transmitter unwanted emissions

|                        |                     |                     |
|------------------------|---------------------|---------------------|
| Test place             | Ise EMC Lab.        |                     |
| Semi Anechoic Chamber  | No.2                | No.2                |
| Date                   | July 26, 2022       | July 29, 2022       |
| Temperature / Humidity | 23 deg. C / 55 % RH | 23 deg. C / 56 % RH |
| Engineer               | Kiyoshiro Okazaki   | Takumi Nishida      |
|                        | (Below 1 GHz)       | (Above 1 GHz)       |
| Mode                   | Tx 615.000 MHz      |                     |

| Frequency | Rx SA/TR          |       | Tx SG            |       | Tx                    | Tx                    | Result         |       | Limit          | Margin |                           | Horizontal              |                           | Vertical                |       | Remarks |
|-----------|-------------------|-------|------------------|-------|-----------------------|-----------------------|----------------|-------|----------------|--------|---------------------------|-------------------------|---------------------------|-------------------------|-------|---------|
|           | Reading<br>[dBuV] |       | Reading<br>[dBm] |       | Cable<br>Loss<br>[dB] | Ant.<br>Gain<br>[dBi] | (ERP)<br>[dBm] |       | (ERP)<br>[dBm] | [dB]   | Rx Ant.<br>Height<br>[cm] | Turn<br>Table<br>[deg.] | Rx Ant.<br>Height<br>[cm] | Turn<br>Table<br>[deg.] |       |         |
|           | [MHz]             | Hori. | Vert.            | Hori. |                       |                       | Vert.          | Hori. |                |        |                           |                         |                           |                         | Vert. |         |
| 48.091    | NS                | 38.1  | -                | -40.7 | 1.3                   | -32.6                 | -              | -76.8 | -54.0          | -      | 22.8                      | -                       | -                         | 150                     | 100   |         |
| 614.000   | 27.4              | 25.4  | -62.5            | -63.1 | 5.1                   | -8.0                  | -77.7          | -78.3 | -54.0          | 23.7   | 24.3                      | 141                     | 82                        | 216                     | 246   |         |
| 616.000   | 33.5              | 25.2  | -56.4            | -63.3 | 5.1                   | -8.0                  | -71.6          | -78.5 | -54.0          | 17.6   | 24.5                      | 141                     | 82                        | 216                     | 246   |         |
| 1230.000  | 51.4              | 49.8  | -58.9            | -60.0 | 2.7                   | 6.4                   | -57.3          | -58.3 | -30.0          | 27.3   | 28.3                      | 196                     | 30                        | 116                     | 52    |         |
| 1845.000  | 66.1              | 63.9  | -42.6            | -45.4 | 3.3                   | 10.1                  | -37.9          | -40.7 | -30.0          | 7.9    | 10.7                      | 124                     | 39                        | 116                     | 357   |         |
| 2460.000  | 58.7              | 55.1  | -49.4            | -51.6 | 3.8                   | 10.6                  | -44.7          | -47.0 | -30.0          | 14.7   | 17.0                      | 139                     | 25                        | 223                     | 28    |         |
| 3075.000  | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0          | -      | -                         | -                       | -                         | -                       | -     |         |
| 3690.000  | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0          | -      | -                         | -                       | -                         | -                       | -     |         |
| 4305.000  | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0          | -      | -                         | -                       | -                         | -                       | -     |         |

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - 2.15,

Rx-ANTENNA : Biconical Antenna(25 MHz - 200 MHz), Logperiodic Antenna(200 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Tx-ANTENNA : 120 MHz tuned Dipole Antenna(30 MHz - 120 MHz), Dipole Antenna(120 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

NS : No signal detect.

Detector : Below 1 GHz: Test Receiver QP (RBW: 120 kHz)

Above 1 GHz: Spectrum Analyzer RMS Average (RBW: 1 MHz / VBW: 3 MHz)



## Transmitter unwanted emissions

|                        |                     |                     |
|------------------------|---------------------|---------------------|
| Test place             | Ise EMC Lab.        |                     |
| Semi Anechoic Chamber  | No.2                | No.2                |
| Date                   | July 26, 2022       | July 29, 2022       |
| Temperature / Humidity | 23 deg. C / 55 % RH | 23 deg. C / 56 % RH |
| Engineer               | Kiyoshiro Okazaki   | Takumi Nishida      |
|                        | (Below 1 GHz)       | (Above 1 GHz)       |
| Mode                   | Tx 615.875 MHz      |                     |

| Frequency | Rx SA/TR          |       | Tx SG            |       | Tx                    | Tx                    | Result         |       | Limit          | Margin |       | Horizontal                |                         | Vertical                  |                         | Remarks |
|-----------|-------------------|-------|------------------|-------|-----------------------|-----------------------|----------------|-------|----------------|--------|-------|---------------------------|-------------------------|---------------------------|-------------------------|---------|
|           | Reading<br>[dBuV] |       | Reading<br>[dBm] |       | Cable<br>Loss<br>[dB] | Ant.<br>Gain<br>[dBi] | (ERP)<br>[dBm] |       | (ERP)<br>[dBm] | (dB)   |       | Rx Ant.<br>Height<br>[cm] | Turn<br>Table<br>[deg.] | Rx Ant.<br>Height<br>[cm] | Turn<br>Table<br>[deg.] |         |
|           | [MHz]             | Hori. | Vert.            | Hori. |                       |                       | Vert.          | Hori. |                | Vert.  | Hori. |                           |                         |                           |                         |         |
| 47.747    | NS                | 39.2  | -                | -39.3 | 1.3                   | -32.7                 | -              | -75.5 | -54.0          | -      | 21.5  | -                         | -                       | 150                       | 347                     |         |
| 614.875   | 27.3              | 25.5  | -62.6            | -63.0 | 5.1                   | -8.0                  | -77.8          | -78.2 | -54.0          | 23.8   | 24.2  | 141                       | 310                     | 191                       | 172                     |         |
| 616.875   | 27.3              | 25.4  | -62.6            | -63.1 | 5.1                   | -8.0                  | -77.8          | -78.3 | -54.0          | 23.8   | 24.3  | 141                       | 310                     | 191                       | 172                     |         |
| 1231.750  | 50.8              | 49.5  | -59.6            | -60.3 | 2.7                   | 6.4                   | -58.0          | -58.7 | -30.0          | 28.0   | 28.7  | 124                       | 43                      | 100                       | 224                     |         |
| 1847.625  | 66.6              | 63.2  | -42.2            | -46.1 | 3.3                   | 10.1                  | -37.4          | -41.3 | -30.0          | 7.4    | 11.3  | 126                       | 33                      | 100                       | 50                      |         |
| 2463.500  | 58.8              | 55.2  | -49.3            | -51.5 | 3.8                   | 10.6                  | -44.6          | -46.9 | -30.0          | 14.6   | 16.9  | 124                       | 34                      | 165                       | 39                      |         |
| 3079.375  | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0          | -      | -     | -                         | -                       | -                         | -                       |         |
| 3695.250  | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0          | -      | -     | -                         | -                       | -                         | -                       |         |
| 4311.125  | NS                | NS    | -                | -     | -                     | -                     | -              | -     | -30.0          | -      | -     | -                         | -                       | -                         | -                       |         |

Calculation Result = SG Reading - Tx Cable Loss + Tx Antenna Gain - 2.15,

Rx-ANTENNA : Biconical Antenna(25 MHz - 200 MHz), Logperiodic Antenna(200 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Tx-ANTENNA : 120 MHz tuned Dipole Antenna(30 MHz - 120 MHz), Dipole Antenna(120 MHz - 1000 MHz), Horn Antenna(1 GHz - 12.75 GHz)

Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

NS : No signal detect.

Detector : Below 1 GHz: Test Receiver QP (RBW: 120 kHz)

Above 1 GHz: Spectrum Analyzer RMS Average (RBW: 1 MHz / VBW: 3 MHz)

## Frequency Tolerance

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
August 4, 2022  
22 deg. C / 52 % RH  
Ken Fujita  
Tx 543.000 MHz 25mW

### Varying Temperature

| Temp.<br>[deg. C] | Test condition |           | Tested<br>timing | Measured<br>frequency<br>[MHz] | Frequency<br>error<br>[MHz] | Result   |       | Limit |
|-------------------|----------------|-----------|------------------|--------------------------------|-----------------------------|----------|-------|-------|
|                   | Voltage<br>[V] |           |                  |                                |                             | [%]      | [ppm] |       |
| 50                | 5.00           | Power on  |                  | 542.999838                     | -0.000162                   | -0.00003 | -0.3  | 0.005 |
|                   |                | + 2 min.  |                  | 542.999837                     | -0.000163                   | -0.00003 | -0.3  | 0.005 |
|                   |                | + 5 min.  |                  | 542.999837                     | -0.000163                   | -0.00003 | -0.3  | 0.005 |
|                   |                | + 10 min. |                  | 542.999837                     | -0.000163                   | -0.00003 | -0.3  | 0.005 |
| 40                | 5.00           | Power on  |                  | 542.999824                     | -0.000176                   | -0.00003 | -0.3  | 0.005 |
|                   |                | + 2 min.  |                  | 542.999822                     | -0.000178                   | -0.00003 | -0.3  | 0.005 |
|                   |                | + 5 min.  |                  | 542.999822                     | -0.000178                   | -0.00003 | -0.3  | 0.005 |
|                   |                | + 10 min. |                  | 542.999822                     | -0.000178                   | -0.00003 | -0.3  | 0.005 |
| 30                | 5.00           | Power on  |                  | 542.999832                     | -0.000168                   | -0.00003 | -0.3  | 0.005 |
|                   |                | + 2 min.  |                  | 542.999846                     | -0.000154                   | -0.00003 | -0.3  | 0.005 |
|                   |                | + 5 min.  |                  | 542.999856                     | -0.000144                   | -0.00003 | -0.3  | 0.005 |
|                   |                | + 10 min. |                  | 542.999860                     | -0.000140                   | -0.00003 | -0.3  | 0.005 |
| 20                | 5.00           | Power on  |                  | 542.999960                     | -0.000040                   | -0.00001 | -0.1  | 0.005 |
|                   |                | + 2 min.  |                  | 542.999982                     | -0.000018                   | 0.00000  | 0.0   | 0.005 |
|                   |                | + 5 min.  |                  | 543.000006                     | 0.000006                    | 0.00000  | 0.0   | 0.005 |
|                   |                | + 10 min. |                  | 543.000026                     | 0.000026                    | 0.00000  | 0.0   | 0.005 |
| 10                | 5.00           | Power on  |                  | 543.000186                     | 0.000186                    | 0.00003  | 0.3   | 0.005 |
|                   |                | + 2 min.  |                  | 543.000194                     | 0.000194                    | 0.00004  | 0.4   | 0.005 |
|                   |                | + 5 min.  |                  | 543.000209                     | 0.000209                    | 0.00004  | 0.4   | 0.005 |
|                   |                | + 10 min. |                  | 543.000216                     | 0.000216                    | 0.00004  | 0.4   | 0.005 |
| 0                 | 5.00           | Power on  |                  | 543.000149                     | 0.000149                    | 0.00003  | 0.3   | 0.005 |
|                   |                | + 2 min.  |                  | 543.000130                     | 0.000130                    | 0.00002  | 0.2   | 0.005 |
|                   |                | + 5 min.  |                  | 543.000102                     | 0.000102                    | 0.00002  | 0.2   | 0.005 |
|                   |                | + 10 min. |                  | 543.000094                     | 0.000094                    | 0.00002  | 0.2   | 0.005 |
| -10               | 5.00           | Power on  |                  | 542.999964                     | -0.000036                   | -0.00001 | -0.1  | 0.005 |
|                   |                | + 2 min.  |                  | 542.999965                     | -0.000035                   | -0.00001 | -0.1  | 0.005 |
|                   |                | + 5 min.  |                  | 542.999966                     | -0.000034                   | -0.00001 | -0.1  | 0.005 |
|                   |                | + 10 min. |                  | 542.999967                     | -0.000033                   | -0.00001 | -0.1  | 0.005 |
| -20               | 5.00           | Power on  |                  | 543.000009                     | 0.000009                    | 0.00000  | 0.0   | 0.005 |
|                   |                | + 2 min.  |                  | 543.000031                     | 0.000031                    | 0.00001  | 0.1   | 0.005 |
|                   |                | + 5 min.  |                  | 543.000046                     | 0.000046                    | 0.00001  | 0.1   | 0.005 |
|                   |                | + 10 min. |                  | 543.000062                     | 0.000062                    | 0.00001  | 0.1   | 0.005 |

Calculation formula:

Frequency error = Measured frequency - Tested frequency

Result [%] = Frequency error / Tested frequency \* 100

## Frequency Tolerance

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
August 4, 2022  
22 deg. C / 52 % RH  
Ken Fujita  
Tx 543.000 MHz 25mW

### Varying Supply Voltage

| Temp.<br>[deg. C] | Test condition<br>Voltage<br>[V] | Tested<br>timing | Measured<br>frequency<br>[MHz] | Frequency<br>error<br>[MHz] | Result   |       | Limit<br>[+/- %] |
|-------------------|----------------------------------|------------------|--------------------------------|-----------------------------|----------|-------|------------------|
|                   |                                  |                  |                                |                             | [%]      | [ppm] |                  |
| 20                | 3.00                             | Power on         | 542.999960                     | -0.000040                   | -0.00001 | -0.1  | 0.005            |
|                   |                                  | + 2 min.         | 542.999982                     | -0.000018                   | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 5 min.         | 543.000006                     | 0.000006                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 10 min.        | 543.000026                     | 0.000026                    | 0.00000  | 0.0   | 0.005            |
| 20                | 2.55<br>(3.0 V -15 %)            | Power on         | 543.000053                     | 0.000053                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 2 min.         | 543.000030                     | 0.000030                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 5 min.         | 543.000018                     | 0.000018                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 10 min.        | 543.000015                     | 0.000015                    | 0.00000  | 0.0   | 0.005            |
| 20                | 3.45<br>(3.0 V +15 %)            | Power on         | 543.000004                     | 0.000004                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 2 min.         | 542.999997                     | -0.000003                   | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 5 min.         | 542.999996                     | -0.000004                   | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 10 min.        | 542.999995                     | -0.000005                   | 0.00000  | 0.0   | 0.005            |
| 20                | 2.39<br>( Battery end point )    | Power on         | 543.001763                     | 0.001763                    | 0.00032  | 3.2   | 0.005            |
|                   |                                  | + 2 min.         | 543.001791                     | 0.001791                    | 0.00033  | 3.3   | 0.005            |
|                   |                                  | + 5 min.         | 543.001799                     | 0.001799                    | 0.00033  | 3.3   | 0.005            |
|                   |                                  | + 10 min.        | 543.001842                     | 0.001842                    | 0.00034  | 3.4   | 0.005            |

Calculation formula:

Frequency error = Measured frequency - Tested frequency  
Result [%] = Frequency error / Tested frequency \* 100

### Varying Supply Voltage (USB)

| Temp.<br>[deg. C] | Test condition<br>Voltage<br>[V] | Tested<br>timing | Measured<br>frequency<br>[MHz] | Frequency<br>error<br>[MHz] | Result   |       | Limit<br>[+/- %] |
|-------------------|----------------------------------|------------------|--------------------------------|-----------------------------|----------|-------|------------------|
|                   |                                  |                  |                                |                             | [%]      | [ppm] |                  |
| 20                | 5.00                             | Power on         | 542.999960                     | -0.000040                   | -0.00001 | -0.1  | 0.005            |
|                   |                                  | + 2 min.         | 542.999982                     | -0.000018                   | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 5 min.         | 543.000006                     | 0.000006                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 10 min.        | 543.000026                     | 0.000026                    | 0.00000  | 0.0   | 0.005            |
| 20                | 4.25<br>(5.0 V -15 %)            | Power on         | 543.000012                     | 0.000012                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 2 min.         | 543.000007                     | 0.000007                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 5 min.         | 543.000001                     | 0.000001                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 10 min.        | 542.999998                     | -0.000002                   | 0.00000  | 0.0   | 0.005            |
| 20                | 5.75<br>(5.0 V +15 %)            | Power on         | 543.000053                     | 0.000053                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 2 min.         | 543.000028                     | 0.000028                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 5 min.         | 543.000018                     | 0.000018                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 10 min.        | 543.000009                     | 0.000009                    | 0.00000  | 0.0   | 0.005            |
| 20                | 4.14<br>end point                | Power on         | 543.000038                     | 0.000038                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 2 min.         | 543.000034                     | 0.000034                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 5 min.         | 543.000032                     | 0.000032                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 10 min.        | 543.000031                     | 0.000031                    | 0.00001  | 0.1   | 0.005            |

Calculation formula:

Frequency error = Measured frequency - Tested frequency  
Result [%] = Frequency error / Tested frequency \* 100

## Frequency Tolerance

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
August 4, 2022  
22 deg. C / 52 % RH  
Ken Fujita  
Tx 615.000 MHz 10mW

### Varying Temperature

| Temp.<br>[deg. C] | Test condition |  | Tested<br>timing | Measured<br>frequency<br>[MHz] | Frequency<br>error<br>[MHz] | Result   |       | Limit |
|-------------------|----------------|--|------------------|--------------------------------|-----------------------------|----------|-------|-------|
|                   | Voltage<br>[V] |  |                  |                                |                             | [%]      | [ppm] |       |
| 50                | 5.00           |  | Power on         | 614.999794                     | -0.000206                   | -0.00003 | -0.3  | 0.005 |
|                   |                |  | + 2 min.         | 614.999793                     | -0.000207                   | -0.00003 | -0.3  | 0.005 |
|                   |                |  | + 5 min.         | 614.999794                     | -0.000206                   | -0.00003 | -0.3  | 0.005 |
|                   |                |  | + 10 min.        | 614.999794                     | -0.000206                   | -0.00003 | -0.3  | 0.005 |
| 40                | 5.00           |  | Power on         | 614.999777                     | -0.000223                   | -0.00004 | -0.4  | 0.005 |
|                   |                |  | + 2 min.         | 614.999775                     | -0.000225                   | -0.00004 | -0.4  | 0.005 |
|                   |                |  | + 5 min.         | 614.999774                     | -0.000226                   | -0.00004 | -0.4  | 0.005 |
|                   |                |  | + 10 min.        | 614.999772                     | -0.000228                   | -0.00004 | -0.4  | 0.005 |
| 30                | 5.00           |  | Power on         | 614.999782                     | -0.000218                   | -0.00004 | -0.4  | 0.005 |
|                   |                |  | + 2 min.         | 614.999788                     | -0.000212                   | -0.00003 | -0.3  | 0.005 |
|                   |                |  | + 5 min.         | 614.999794                     | -0.000206                   | -0.00003 | -0.3  | 0.005 |
|                   |                |  | + 10 min.        | 614.999798                     | -0.000202                   | -0.00003 | -0.3  | 0.005 |
| 20                | 5.00           |  | Power on         | 614.999862                     | -0.000138                   | -0.00002 | -0.2  | 0.005 |
|                   |                |  | + 2 min.         | 614.999876                     | -0.000124                   | -0.00002 | -0.2  | 0.005 |
|                   |                |  | + 5 min.         | 614.999896                     | -0.000104                   | -0.00002 | -0.2  | 0.005 |
|                   |                |  | + 10 min.        | 614.999916                     | -0.000084                   | -0.00001 | -0.1  | 0.005 |
| 10                | 5.00           |  | Power on         | 615.000089                     | 0.000089                    | 0.00001  | 0.1   | 0.005 |
|                   |                |  | + 2 min.         | 615.000113                     | 0.000113                    | 0.00002  | 0.2   | 0.005 |
|                   |                |  | + 5 min.         | 615.000132                     | 0.000132                    | 0.00002  | 0.2   | 0.005 |
|                   |                |  | + 10 min.        | 615.000150                     | 0.000150                    | 0.00002  | 0.2   | 0.005 |
| 0                 | 5.00           |  | Power on         | 615.000151                     | 0.000151                    | 0.00002  | 0.2   | 0.005 |
|                   |                |  | + 2 min.         | 615.000130                     | 0.000130                    | 0.00002  | 0.2   | 0.005 |
|                   |                |  | + 5 min.         | 615.000113                     | 0.000113                    | 0.00002  | 0.2   | 0.005 |
|                   |                |  | + 10 min.        | 615.000102                     | 0.000102                    | 0.00002  | 0.2   | 0.005 |
| -10               | 5.00           |  | Power on         | 614.999940                     | -0.000060                   | -0.00001 | -0.1  | 0.005 |
|                   |                |  | + 2 min.         | 614.999939                     | -0.000061                   | -0.00001 | -0.1  | 0.005 |
|                   |                |  | + 5 min.         | 614.999937                     | -0.000063                   | -0.00001 | -0.1  | 0.005 |
|                   |                |  | + 10 min.        | 614.999937                     | -0.000063                   | -0.00001 | -0.1  | 0.005 |
| -20               | 5.00           |  | Power on         | 615.000028                     | 0.000028                    | 0.00000  | 0.0   | 0.005 |
|                   |                |  | + 2 min.         | 615.000043                     | 0.000043                    | 0.00001  | 0.1   | 0.005 |
|                   |                |  | + 5 min.         | 615.000050                     | 0.000050                    | 0.00001  | 0.1   | 0.005 |
|                   |                |  | + 10 min.        | 615.000055                     | 0.000055                    | 0.00001  | 0.1   | 0.005 |

Calculation formula:

Frequency error = Measured frequency - Tested frequency

Result [%] = Frequency error / Tested frequency \* 100

## Frequency Tolerance

Test place  
Date  
Temperature / Humidity  
Engineer  
Mode

Ise EMC Lab. No.8 Measurement Room  
August 4, 2022  
22 deg. C / 52 % RH  
Ken Fujita  
Tx 615.000 MHz 10mW

### Varying Supply Voltage

| Temp.<br>[deg. C] | Test condition<br>Voltage<br>[V] | Tested<br>timing | Measured<br>frequency<br>[MHz] | Frequency<br>error<br>[MHz] | Result   |       | Limit<br>[+/- %] |
|-------------------|----------------------------------|------------------|--------------------------------|-----------------------------|----------|-------|------------------|
|                   |                                  |                  |                                |                             | [%]      | [ppm] |                  |
| 20                | 3.00                             | Power on         | 614.999862                     | -0.000138                   | -0.00002 | -0.2  | 0.005            |
|                   |                                  | + 2 min.         | 614.999876                     | -0.000124                   | -0.00002 | -0.2  | 0.005            |
|                   |                                  | + 5 min.         | 614.999896                     | -0.000104                   | -0.00002 | -0.2  | 0.005            |
|                   |                                  | + 10 min.        | 614.999916                     | -0.000084                   | -0.00001 | -0.1  | 0.005            |
| 20                | 2.55<br>(3.0 V -15 %)            | Power on         | 615.000051                     | 0.000051                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 2 min.         | 615.000044                     | 0.000044                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 5 min.         | 615.000042                     | 0.000042                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 10 min.        | 615.000039                     | 0.000039                    | 0.00001  | 0.1   | 0.005            |
| 20                | 3.45<br>(3.0 V +15 %)            | Power on         | 614.999986                     | -0.000014                   | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 2 min.         | 614.999989                     | -0.000011                   | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 5 min.         | 614.999982                     | -0.000018                   | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 10 min.        | 614.999995                     | -0.000005                   | 0.00000  | 0.0   | 0.005            |
| 20                | 2.39<br>( Battery end point )    | Power on         | 615.000038                     | 0.000038                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 2 min.         | 615.000037                     | 0.000037                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 5 min.         | 615.000036                     | 0.000036                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 10 min.        | 615.000035                     | 0.000035                    | 0.00001  | 0.1   | 0.005            |

Calculation formula:

Frequency error = Measured frequency - Tested frequency  
Result [%] = Frequency error / Tested frequency \* 100

### Varying Supply Voltage (USB)

| Temp.<br>[deg. C] | Test condition<br>Voltage<br>[V] | Tested<br>timing | Measured<br>frequency<br>[MHz] | Frequency<br>error<br>[MHz] | Result   |       | Limit<br>[+/- %] |
|-------------------|----------------------------------|------------------|--------------------------------|-----------------------------|----------|-------|------------------|
|                   |                                  |                  |                                |                             | [%]      | [ppm] |                  |
| 20                | 5.00                             | Power on         | 614.999862                     | -0.000138                   | -0.00002 | -0.2  | 0.005            |
|                   |                                  | + 2 min.         | 614.999876                     | -0.000124                   | -0.00002 | -0.2  | 0.005            |
|                   |                                  | + 5 min.         | 614.999896                     | -0.000104                   | -0.00002 | -0.2  | 0.005            |
|                   |                                  | + 10 min.        | 614.999916                     | -0.000084                   | -0.00001 | -0.1  | 0.005            |
| 20                | 4.25<br>(5.0 V -15 %)            | Power on         | 615.000005                     | 0.000005                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 2 min.         | 615.000003                     | 0.000003                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 5 min.         | 615.000003                     | 0.000003                    | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 10 min.        | 615.000002                     | 0.000002                    | 0.00000  | 0.0   | 0.005            |
| 20                | 5.75<br>(5.0 V +15 %)            | Power on         | 614.999977                     | -0.000023                   | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 2 min.         | 614.999976                     | -0.000024                   | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 5 min.         | 614.999977                     | -0.000023                   | 0.00000  | 0.0   | 0.005            |
|                   |                                  | + 10 min.        | 614.999977                     | -0.000023                   | 0.00000  | 0.0   | 0.005            |
| 20                | 4.14<br>end point                | Power on         | 615.000057                     | 0.000057                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 2 min.         | 615.000053                     | 0.000053                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 5 min.         | 615.000049                     | 0.000049                    | 0.00001  | 0.1   | 0.005            |
|                   |                                  | + 10 min.        | 615.000042                     | 0.000042                    | 0.00001  | 0.1   | 0.005            |

Calculation formula:

Frequency error = Measured frequency - Tested frequency  
Result [%] = Frequency error / Tested frequency \* 100

## APPENDIX 2: Test Instruments

### Test Equipment (1/2)

| Test Item | Local ID     | LIMS ID | Description                    | Manufacturer                    | Model                            | Serial                        | Last Calibration Date | Cal Int |
|-----------|--------------|---------|--------------------------------|---------------------------------|----------------------------------|-------------------------------|-----------------------|---------|
| CE        | MAEC-01      | 141998  | AC1_Semi Anechoic Chamber(NSA) | TDK                             | Semi Anechoic Chamber 10m        | DA-06881                      | 06/28/2022            | 24      |
| CE        | MOS-27       | 141566  | Thermo-Hygrometer              | CUSTOM. Inc                     | CTH-201                          | A08Q26                        | 01/10/2022            | 12      |
| CE        | MMM-03       | 141530  | Digital Tester                 | Fluke Corporation               | FLUKE 26-3                       | 78030621                      | 08/10/2021            | 12      |
| CE        | MJM-25       | 142226  | Measure                        | KOMELON                         | KMC-36                           | -                             | -                     | -       |
| CE        | COTS-MEMI-02 | 178648  | EMI measurement program        | TSJ (Techno Science Japan)      | TEPTO-DV                         | -                             | -                     | -       |
| CE        | MCC-03       | 141215  | Coaxial Cable                  | Fujikura/Suhner/TSJ             | 5D-2W/3D-2W/RG400u/ RFM-E421(SW) | -/01068(Switcher)             | 06/11/2022            | 12      |
| CE        | MAT-67       | 141248  | Attenuator                     | JFW Industries, Inc.            | 50FP-013H2 N                     | -                             | 12/17/2021            | 12      |
| CE        | MLS-23       | 141357  | LISN(AMN)                      | Schwarzbeck Mess-Elektronik OHG | NSLK8127                         | 8127-729                      | 07/28/2022            | 12      |
| RE        | MAEC-02      | 142004  | AC2_Semi Anechoic Chamber(NSA) | TDK                             | Semi Anechoic Chamber 3m         | DA-06902                      | 05/30/2022            | 24      |
| RE        | MOS-41       | 192300  | Thermo-Hygrometer              | CUSTOM. Inc                     | CTH-201                          | 0013                          | 12/19/2021            | 12      |
| RE        | MMM-01       | 141542  | Digital Tester                 | Fluke Corporation               | FLUKE 26-3                       | 78030611                      | 08/12/2022            | 12      |
| RE        | MJM-27       | 142228  | Measure                        | KOMELON                         | KMC-36                           | -                             | -                     | -       |
| RE        | MBA-05       | 141425  | Biconical Antenna              | Schwarzbeck Mess-Elektronik OHG | VHA9103+ BBA9106                 | VHA 91031302                  | 08/28/2021            | 12      |
| RE        | LA-17        | 160924  | Logperiodic Antenna            | Schwarzbeck Mess-Elektronik OHG | VUSLP9111B                       | 225                           | 11/13/2021            | 12      |
| RE        | MAT-112      | 220646  | Attenuator                     | Huber+Suhner                    | 6806_N-50-1                      | -                             | 06/07/2022            | 12      |
| RE        | MCC-12       | 141317  | Coaxial Cable                  | UL Japan                        | -                                | -                             | 09/06/2021            | 12      |
| RE        | MTR-09       | 141950  | EMI Test Receiver              | Rohde & Schwarz                 | ESU26                            | 100412                        | 10/14/2021            | 12      |
| RE        | MBF-06       | 141369  | Band Pass Filter               | M-City                          | BPF0950-01                       | UL0002                        | 02/14/2022            | 12      |
| RE        | MCC-38       | 141395  | Coaxial Cable                  | UL Japan                        | -                                | -                             | 11/19/2021            | 12      |
| RE        | MPA-24       | 141594  | Pre Amplifier                  | Keysight Technologies Inc       | 8447D                            | 2944A10150                    | 02/25/2022            | 12      |
| RE        | YTSSG03      | 141967  | Signal Generator               | Rohde & Schwarz                 | SMT02                            | 51400043                      | 08/05/2022            | 12      |
| RE        | MCC-125      | 141219  | Coaxial Cable                  | UL Japan                        | -                                | -                             | 07/09/2022            | 12      |
| RE        | MDA-01       | 141464  | Dipole Antenna                 | Schwarzbeck Mess-Elektronik OHG | VHAP                             | 1018                          | 12/02/2021            | 12      |
| RE        | MDA-03       | 141454  | Dipole Antenna                 | Schwarzbeck Mess-Elektronik OHG | UHAP                             | 991                           | 12/02/2021            | 12      |
| RE        | MHA-06       | 141512  | Horn Antenna 1-18GHz           | Schwarzbeck Mess-Elektronik OHG | BBHA9120D                        | 254                           | 10/21/2021            | 12      |
| RE        | MCC-218      | 141394  | Microwave Cable                | Junkosha                        | MWX221                           | 1607S141(1 m) / 1608S264(5 m) | 09/30/2021            | 12      |
| RE        | MPA-10       | 141579  | Pre Amplifier                  | Keysight Technologies Inc       | 8449B                            | 3008A02142                    | 02/22/2022            | 12      |
| RE        | MSA-16       | 141903  | Spectrum Analyzer              | Keysight Technologies Inc       | E4440A                           | MY46186390                    | 01/07/2022            | 12      |
| RE        | MHF-27       | 141297  | High Pass Filter (1.1-10GHz)   | TOKYO KEIKI                     | TF219CD1                         | 1001                          | 01/23/2022            | 12      |
| RE        | MTR-08       | 141949  | Test Receiver                  | Rohde & Schwarz                 | ESCI                             | 100767                        | 08/05/2021            | 12      |
| RE        | MAT-17       | 141171  | Attenuator(20dB)_DC-1GHz_N     | Weinschel Corp                  | MODEL 1                          | BG0143                        | 12/23/2021            | 12      |
| RE        | COTS-MEMI-02 | 178648  | EMI measurement program        | TSJ (Techno Science Japan)      | TEPTO-DV                         | -                             | -                     | -       |
| RE        | MHA-30       | 141514  | Horn Antenna 1-18GHz           | Schwarzbeck Mess-Elektronik OHG | BBHA9120D                        | 01611                         | 06/22/2022            | 12      |
| RE        | MCC-258      | 214065  | Microwave cable                | Huber+Suhner                    | SF-126E/11PC35/11P C35/10000     | 550489/126E                   | 01/18/2022            | 12      |
| RE        | MSG-23       | 213581  | Signal Generator               | Rohde & Schwarz                 | SMW200A                          | 107688                        | 02/03/2022            | 12      |

## Test Equipment (2/2)

| Test Item | Local ID | LIMS ID | Description         | Manufacturer                      | Model     | Serial     | Last Calibration Date | Cal Int |
|-----------|----------|---------|---------------------|-----------------------------------|-----------|------------|-----------------------|---------|
| AT        | MSA-14   | 141901  | Spectrum Analyzer   | Keysight Technologies Inc         | E4440A    | MY48250080 | 01/10/2022            | 12      |
| AT        | MCC-64   | 141327  | Coaxial Cable       | UL Japan                          | -         | -          | 02/28/2022            | 12      |
| AT        | MPM-16   | 141812  | Power Meter         | Keysight Technologies Inc         | 8990B     | MY51000271 | 08/05/2022            | 12      |
| AT        | MPSE-23  | 141835  | Power sensor        | Keysight Technologies Inc         | N1923A    | MY54070004 | 08/05/2022            | 12      |
| AT        | MAT-82   | 141249  | Attenuator          | Weinschel Associates              | WA1-20-33 | 100132     | 04/06/2022            | 12      |
| AT        | MOS-28   | 141567  | Thermo-Hygrometer   | CUSTOM. Inc                       | CTH-201   | 0008       | 01/10/2022            | 12      |
| AT        | MMM-17   | 141557  | DIGITAL HiTESTER    | HIOKI E.E. CORPORATION            | 3805      | 70900530   | 01/16/2022            | 12      |
| AT        | MCC-128  | 141221  | Coaxial Cable       | Suhner                            | NRG180    | -          | 08/11/2021            | 12      |
| AT        | MCC-38   | 141395  | Coaxial Cable       | UL Japan                          | -         | -          | 11/19/2021            | 12      |
| AT        | MAT-26   | 141244  | Attenuator(10dB)    | Weinschel - API Technologies Corp | WA8-10-34 | A198       | 02/25/2022            | 12      |
| AT        | MFC-01   | 141498  | Microwave Counter   | ADVANTEST                         | R5373     | 120100309  | 07/15/2022            | 12      |
| AT        | MCH-07   | 141441  | Temperature Chamber | Espec                             | SU-241    | 92013843   | 07/09/2022            | 12      |

\*Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

The expiration date of the calibration is the end of the expired month

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item:           CE: Conducted Emission  
                          RE: Radiated Emission  
                          AT: Antenna Terminal Conducted