



# RADIO TEST REPORT

**Test Report No. : 13999840H-A-R1**

**Applicant** : Pacific Industrial Company, LTD.  
**Type of EUT** : TPMS (Tire Pressure Monitoring System Transmitter)  
**Model Number of EUT** : PMV-G101  
**FCC ID** : PAXPMVG101  
**Test regulation** : FCC Part 15 Subpart C: 2021  
**Test Result** : Complied (Refer to SECTION 3)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan, Inc. has been accredited.
9. The information provided from the customer for this report is identified in Section 1.
10. This report is a revised version of 13999840H-A. 13999840H-A is replaced with this report.

**Date of test:** October 6 and November 25, 2021

**Representative test engineer:** Kiyo  
Kiyoshiro Okazaki  
Engineer

**Approved by:** Shinichi Miyazono  
Shinichi Miyazono  
Engineer



CERTIFICATE 5107.02

- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.  
 There is no testing item of "Non-accreditation".

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## REVISION HISTORY

Original Test Report No.: 13999840H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13999840H-A	November 30, 2021	-	-
1	13999840H-A-R1	December 8, 2021	P.18	Deletion of the following formula; $\text{Tx on} / (\text{Tx on} + \text{Tx off}) = 0.084$ $\text{Tx on} / (\text{Tx on} + \text{Tx off}) * 100 = 8.4\%$

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

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

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## **SECTION 1: Customer information**

Company Name : Pacific Industrial Company, LTD.  
Address : 1300-1, YOKOI, GODO-CHO, ANPACHI-GUN, GIFU 503-2397,  
JAPAN  
Telephone Number : +81-584-28-0111  
Contact Person : Masashi Hattori

The information provided from the customer is as follows;

- Applicant, Type 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
- 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**

Type : TPMS (Tire Pressure Monitoring System Transmitter)  
Model Number : PMV-G101  
Serial Number : Refer to SECTION 4.2  
Receipt Date : September 9, 2021  
Condition : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification : No Modification by the test lab

### **2.2 Product Description**

Model: PMV-G101 (referred to as the EUT in this report) is a TPMS (Tire Pressure Monitoring System Transmitter).

### **General Specification**

Rating : DC 3.0 V

### **Radio Specification**

Radio Type : Transceiver  
Frequency of Operation : 433.90 MHz  
Modulation : FSK  
Antenna type : Flatplane antenna (Built-in type)  
Clock frequency (Maximum) : 26 MHz

\*This transmitter transmits unmodulated center frequency (433.90 MHz) of several hundred  $\mu$  s before and after transmission.

## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C  
FCC Part 15 final revised on May 3, 2021 and effective July 2, 2021

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.231 Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

### **3.2 Procedures and results**

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.207	N/A	N/A	*1)
Automatically Deactivate	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(a)(2) Section 15.231(e)	N/A	Complied a)	Radiated
Electric Field Strength of Fundamental Emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(e)	10.3 dB 433.900 MHz Horizontal PK	Complied b)	Radiated
Electric Field Strength of Spurious Emission	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.205 Section 15.209 Section 15.231(e)	19.7 dB 3905.100 MHz Horizontal PK	Complied b)	Radiated
-20dB Bandwidth	FCC: ANSI C63.10:2013 6 Standard test methods	FCC: Section 15.231(c)	N/A	Complied c)	Radiated

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.  
\*1) The test is not applicable since the EUT does not have AC Mains.

a) Refer to APPENDIX 1 (data of Automatically deactivate)  
b) Refer to APPENDIX 1 (data of Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission))  
c) Refer to APPENDIX 1 (data of -20 dB Bandwidth and 99% Occupied Bandwidth)

Symbols:  
Complied The data of this test item has enough margin, more than the measurement uncertainty.  
Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

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

The test was performed with the New Battery during the tests.  
Therefore, this EUT complies with the requirement.

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

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT.  
Therefore, the equipment complies with the antenna requirement of Section 15.203.

### 3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Bandwidth	ANSI C63.10:2013 6 Standard test methods	Reference data	N/A	-	Radiated

Other than above, no addition, exclusion nor deviation has been made from the standard.

### 3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

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

#### Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)	
3 m	9 kHz to 30 MHz	3.3 dB	
10 m		3.2 dB	
3 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	5.0 dB
	200 MHz to 1000 MHz	(Horizontal)	5.2 dB
		(Vertical)	6.3 dB
10 m	30 MHz to 200 MHz	(Horizontal)	4.8 dB
		(Vertical)	4.8 dB
	200 MHz to 1000 MHz	(Horizontal)	5.0 dB
		(Vertical)	5.0 dB
3 m	1 GHz to 6 GHz	4.9 dB	
	6 GHz to 18 GHz	5.2 dB	
1 m	10 GHz to 26.5 GHz	5.5 dB	
	26.5 GHz to 40 GHz	5.5 dB	
10 m	1 GHz to 18 GHz	5.2 dB	

#### Antenna Terminal test

Test Item	Uncertainty (+/-)
Automatically Deactivate	0.10 %
-20 dB Emission Bandwidth / 99 % Occupied Bandwidth	0.96 %

### 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

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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	-	-

### 3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.



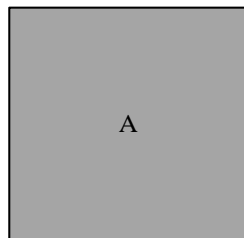
## **SECTION 4: Operation of EUT during testing**

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

<b>Test Item*</b>	<b>Mode</b>
Automatically Deactivate	1) Alert mode 2) Normal use mode
Electric Field Strength of Fundamental Emission Electric Field Strength of Spurious Emission Duty cycle -20 dB Bandwidth & 99 % Occupied Bandwidth	3) Transmitting mode (Tx)
<p>* The system was configured in typical fashion (as a user would normally use it) for testing.  * EUT was set by the software as follows;  Software: PMV-G101 Ver 1.0  (Date: 2021.09.08, Storage location: EUT memory)</p> <p>*This setting of software is the worst case.  Any conditions under the normal use do not exceed the condition of setting.  In addition, end users cannot change the settings of the output power of the product.</p>	

Justification: The system was configured in typical fashion (as a user would normally use it) for testing.

### **4.2 Configuration and peripherals**



\*Setup was taken into consideration and test data was taken under worse case conditions.

#### **Description of EUT**

<b>No.</b>	<b>Item</b>	<b>Model number</b>	<b>Serial number</b>	<b>Manufacturer</b>	<b>Remarks</b>
A	TPMS (Tire Pressure Monitoring System Transmitter)	PMV-G101	0004E2D	Pacific Industrial Company, LTD.	EUT

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## **SECTION 5: Radiated emission (Electric Field Strength of Fundamental and Spurious Emission)**

### **Test Procedure and conditions**

[For below 30 MHz]

The noise level was checked by moving a search-coil (Loop Antenna) close to the EUT.

[For 30 MHz to 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The measuring antenna height was varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detector function of the test receiver / spectrum analyzer.

### **Test Antennas are used as below;**

Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz	Above 1 GHz
Detector Type	Peak	Peak	Peak	Peak	Peak and Peak with Duty factor	Peak and Peak with Duty factor
IF Bandwidth	200 Hz	200 Hz	9.1 kHz	9.1 kHz	120 kHz	PK: S/A: RBW 1 MHz, VBW: 3 MHz

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

Noise levels of all the frequencies were measured at the position.

\*The result is rounded off to the second decimal place, so some differences might be observed.

**Measurement range** : 9 kHz - 4.4 GHz  
**Test data** : APPENDIX  
**Test result** : Pass

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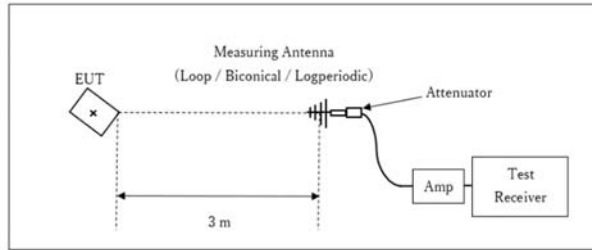
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**[Test Setup]**

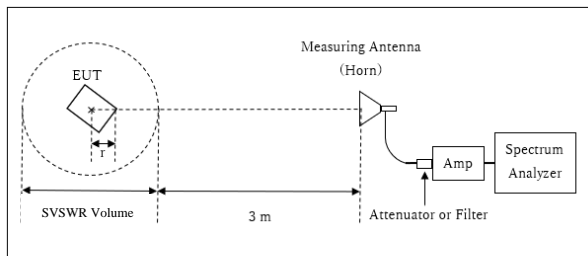
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz - 4.4 GHz



r : Radius of an outer periphery of EUT

x : Center of turn table

Distance Factor:  $20 \times \log(4.0 \text{ m}^*/3.0 \text{ m}) = 2.50 \text{ dB}$   
 \* Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 4.00 \text{ m}$

SVSWR Volume: 2.0 m  
 (SVSWR Volume has been calibrated based on CISPR 16-1-4.)  
 $r = 0.0 \text{ m}$

\* The test was performed with  $r = 0.0 \text{ m}$  since EUT is small and it was the rather conservative condition.

## **SECTION 6: Automatically deactivate**

### **Test Procedure**

The measurement was performed with Electric field strength using a spectrum analyzer.

**Test data** : APPENDIX  
**Test result** : Pass

## **SECTION 7: -20 dB and 99 % Occupied Bandwidth**

### **Test Procedure**

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-20 dB Bandwidth / 99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer

\*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 % .  
Peak hold was applied as Worst-case measurement.

**Test data** : APPENDIX  
**Test result** : Pass

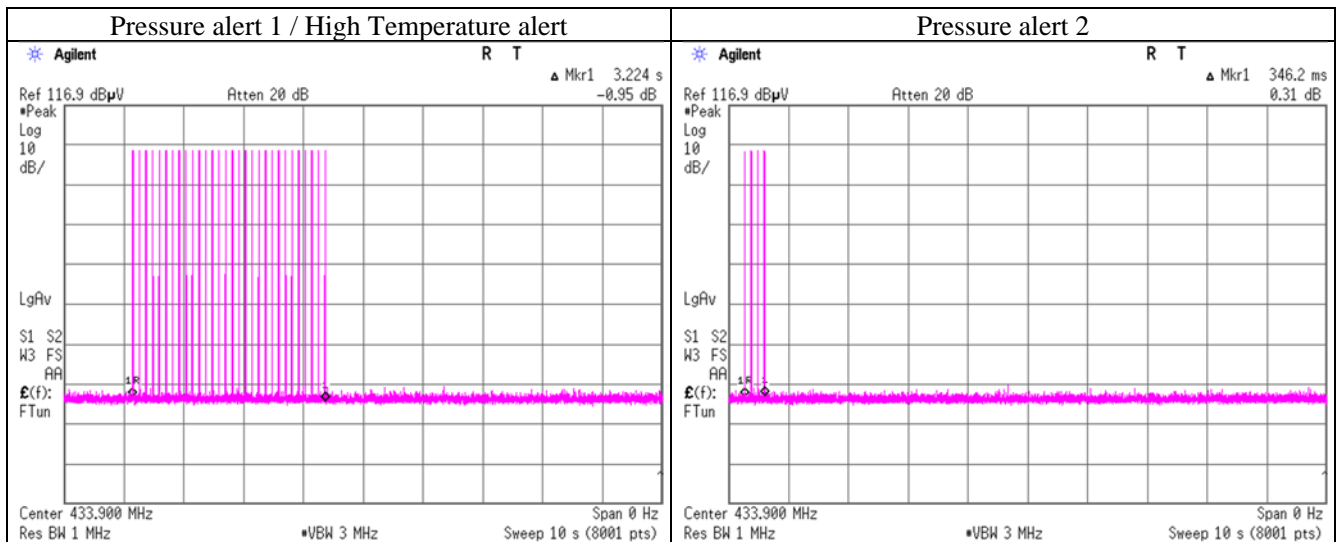
**APPENDIX 1: Test data**

**Automatically deactivate**

Report No. 13999840H  
Test place Ise EMC Lab.  
Measurement Room No.6  
Date November 25, 2021  
Temperature / Humidity 20 deg. C / 40 % RH  
Engineer Hiroyuki Furutaka  
Mode Alert mode

Operation in FCC 15.231(a)(2)

Mode	Tx Frequency [MHz]	Time of Transmitting [sec]	Limit [sec]	Result
Pressure alert 1 / High Temperature alert	433.90	3.2240	5.000	Pass
Pressure alert 2	433.90	0.3462	5.000	Pass



**Automatically deactivate**

Report No. 13999840H  
Test place Ise EMC Lab.  
Measurement Room No.6  
Date November 25, 2021  
Temperature / Humidity 20 deg. C / 40 % RH  
Engineer Hiroyuki Furutaka  
Mode Normal use mode

Operation in FCC 15.231(e)

**Rotating mode 1**

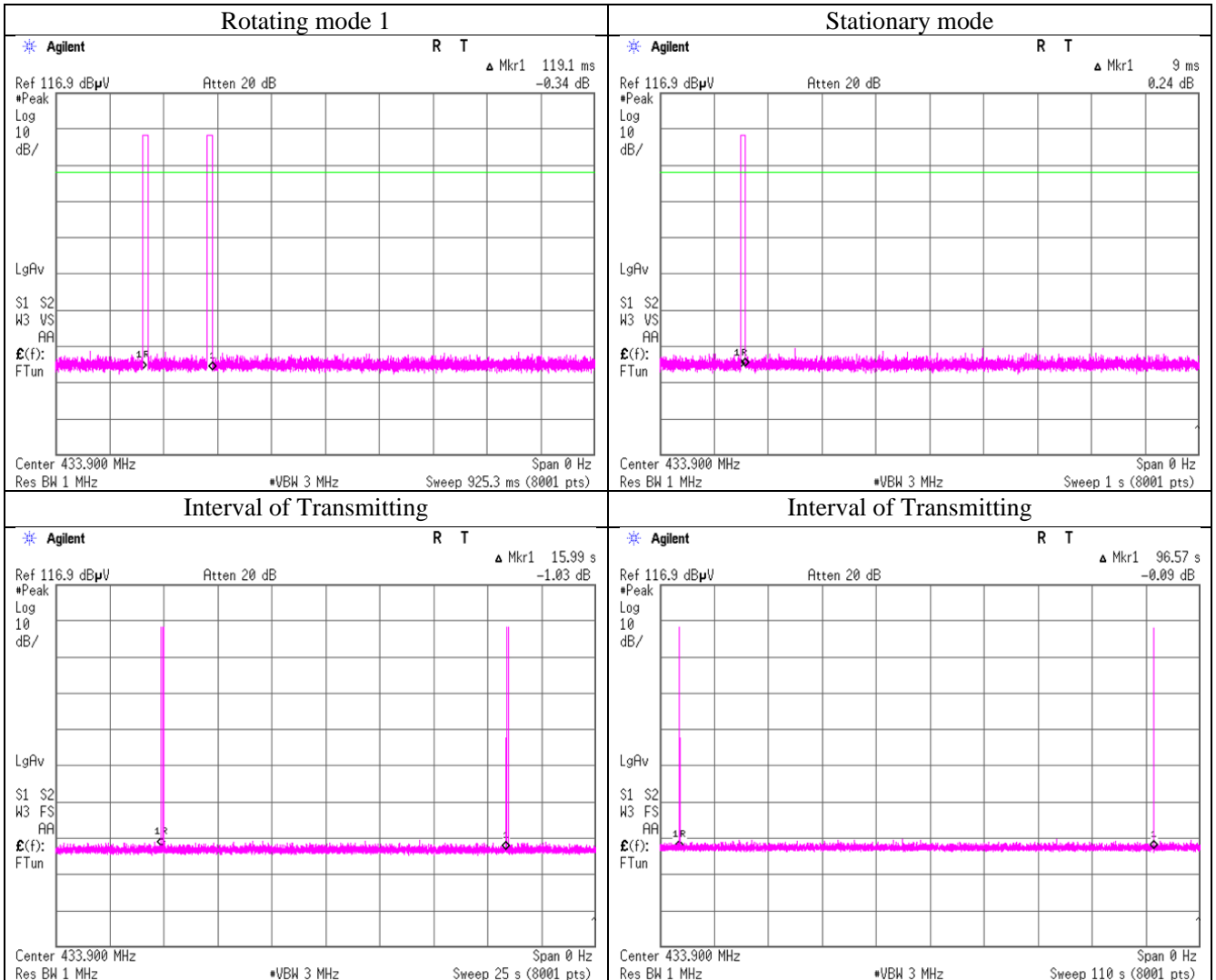
Duration of transmission: 119.1 msec < 1sec

Silent period between transmissions: 15.99 sec - 0.1191 sec = 15.87 sec >30 times the duration of transmission and 10 sec.

**Stationary mode**

Duration of transmission: 9 msec < 1sec

Silent period between transmissions: 96.57 sec - 0.009 sec = 96.56 sec >30 times the duration of transmission and 10 sec.



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**Automatically deactivate**

Report No. 13999840H  
Test place Ise EMC Lab.  
Measurement Room No.6  
Date November 25, 2021  
Temperature / Humidity 20 deg. C / 40 % RH  
Engineer Hiroyuki Furutaka  
Mode Normal use mode

Operation in FCC 15.231(e)

**Rotating mode 2**

**Pulse train 1**

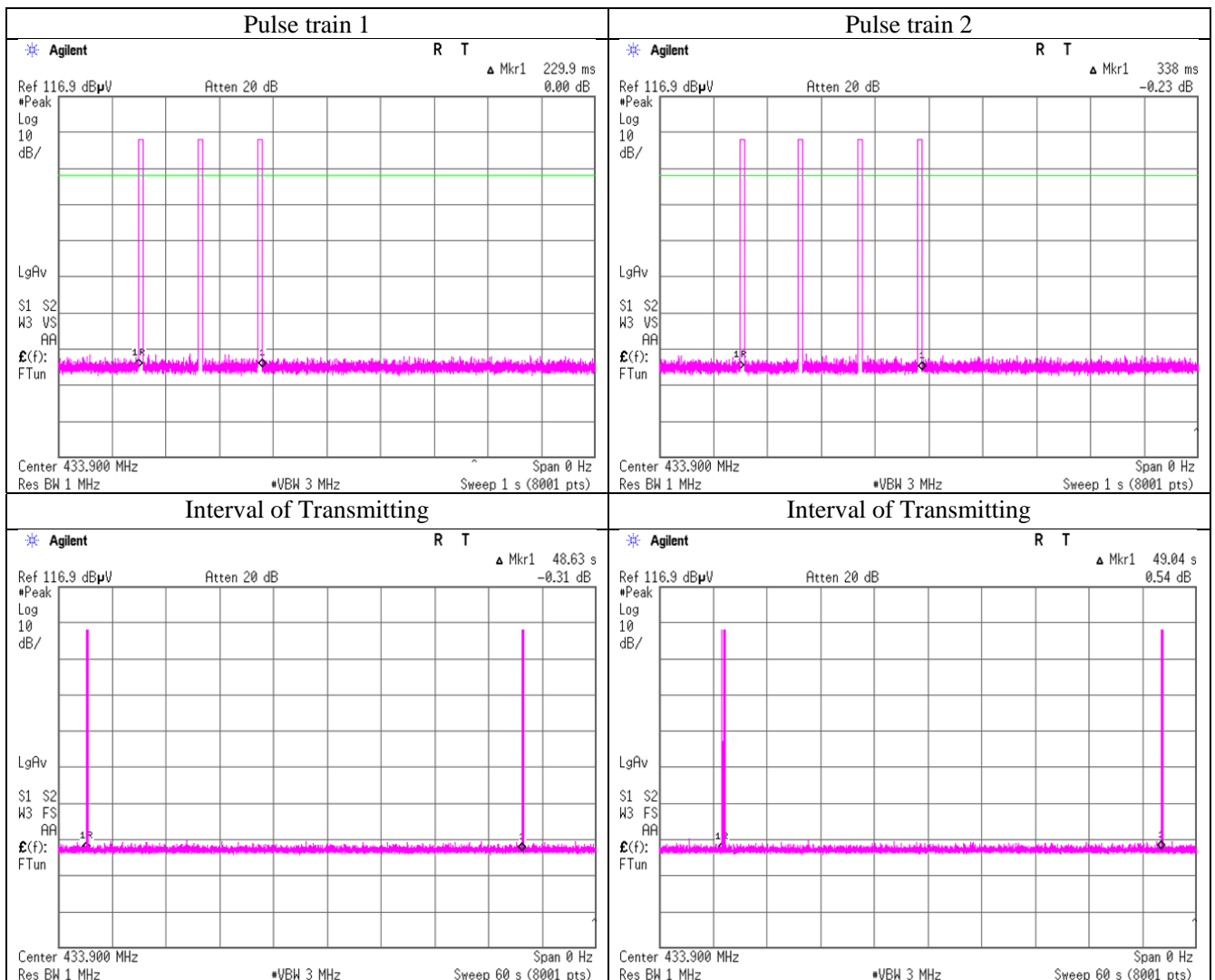
Duration of transmission: 229.9 msec < 1 sec

Silent period between transmissions: 48.63 sec - 0.2299 sec = 48.40 sec > 30 times the duration of transmission and 10 sec.

**Pulse train 2**

Duration of transmission: 338 msec < 1 sec

Silent period between transmissions: 49.04 sec - 0.338 sec = 48.70 sec >30 times the duration of transmission and 10 sec.



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## Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

Report No. 13999840H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date October 6, 2021  
Temperature / Humidity 24 deg. C / 46 % RH  
Engineer Kiyoshiro Okazaki  
Mode Transmitting mode

### QP or PK

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit dBuV/m	Margin [dB]		Remark Inside or Outside of Restricted Bands
		Hor	Ver					Hor	Ver		Hor	Ver	
433.900	PK	87.3	87.2	16.4	11.0	32.1	-	82.6	82.5	92.9	10.3	10.4	Carrier
867.800	PK	38.5	38.5	22.0	13.4	31.2	-	42.8	42.8	72.9	30.1	30.1	Outside
1301.700	PK	42.8	43.0	25.8	6.1	34.4	-	40.3	40.5	72.9	32.6	32.4	Inside
1735.600	PK	47.7	48.3	25.0	5.7	33.4	-	44.9	45.6	72.9	28.0	27.3	Outside
2169.500	PK	44.3	44.7	28.3	5.7	32.7	-	45.7	46.1	72.9	27.2	26.8	Outside
2603.400	PK	46.1	45.9	27.8	5.9	32.5	-	47.3	47.1	72.9	25.6	25.8	Outside
3037.300	PK	49.1	48.9	28.6	6.0	32.3	-	51.4	51.2	72.9	21.5	21.7	Outside
3471.200	PK	46.1	45.3	28.7	6.2	32.1	-	48.9	48.2	72.9	23.9	24.7	Outside
3905.100	PK	48.9	48.6	29.7	6.4	31.9	-	53.1	52.8	72.9	19.7	20.1	Inside
4339.000	PK	45.3	45.6	30.4	6.7	31.8	-	50.6	50.9	72.9	22.3	22.0	Inside

### PK with Duty factor

Frequency [MHz]	Detector	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]		Limit dBuV/m	Margin [dB]		Remark
		Hor	Ver					Hor	Ver		Hor	Ver	
433.900	PK	87.3	87.2	16.4	11.0	32.1	-21.6	61.0	60.9	72.9	11.9	12.0	Carrier
867.800	PK	38.5	38.5	22.0	13.4	31.2	-21.6	21.2	21.2	52.9	31.7	31.7	Outside
1301.700	PK	42.8	43.0	25.8	6.1	34.4	-21.6	18.7	18.9	52.9	34.2	34.0	Inside
1735.600	PK	47.7	48.3	25.0	5.7	33.4	-21.6	23.3	24.0	52.9	29.6	28.9	Outside
2169.500	PK	44.3	44.7	28.3	5.7	32.7	-21.6	24.1	24.5	52.9	28.8	28.4	Outside
2603.400	PK	46.1	45.9	27.8	5.9	32.5	-21.6	25.7	25.5	52.9	27.2	27.4	Outside
3037.300	PK	49.1	48.9	28.6	6.0	32.3	-21.6	29.8	29.6	52.9	23.1	23.3	Outside
3471.200	PK	46.1	45.3	28.7	6.2	32.1	-21.6	27.3	26.6	52.9	25.5	26.3	Outside
3905.100	PK	48.9	48.6	29.7	6.4	31.9	-21.6	31.5	31.2	52.9	21.3	21.7	Inside
4339.000	PK	45.3	45.6	30.4	6.7	31.8	-21.6	29.0	29.3	52.9	23.9	23.6	Inside

Sample calculation:

Result of PK = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1GHz) + Distance factor (above 1 GHz)} - Gain (Amplifier)

Result of PK with Duty factor = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1 GHz) + Distance factor (above 1 GHz)} - Gain (Amplifier) + Duty factor (Refer to Duty Cycle data sheet)

For above 1GHz : Distance Factor:  $20 \times \log(4.0 \text{ m}/3.0 \text{ m}) = 2.50 \text{ dB}$

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

**UL Japan, Inc.**

**Ise EMC Lab.**

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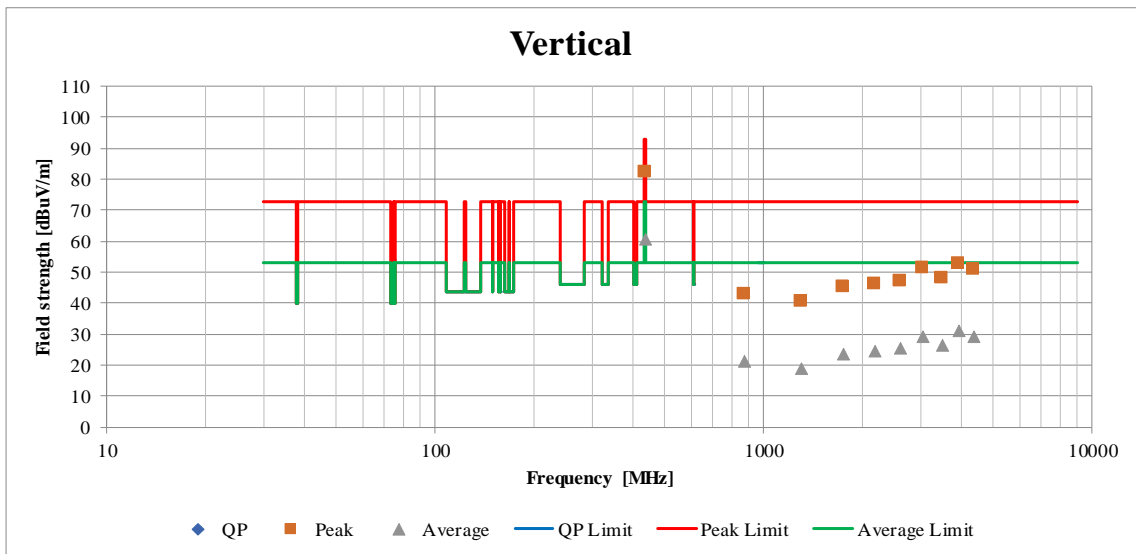
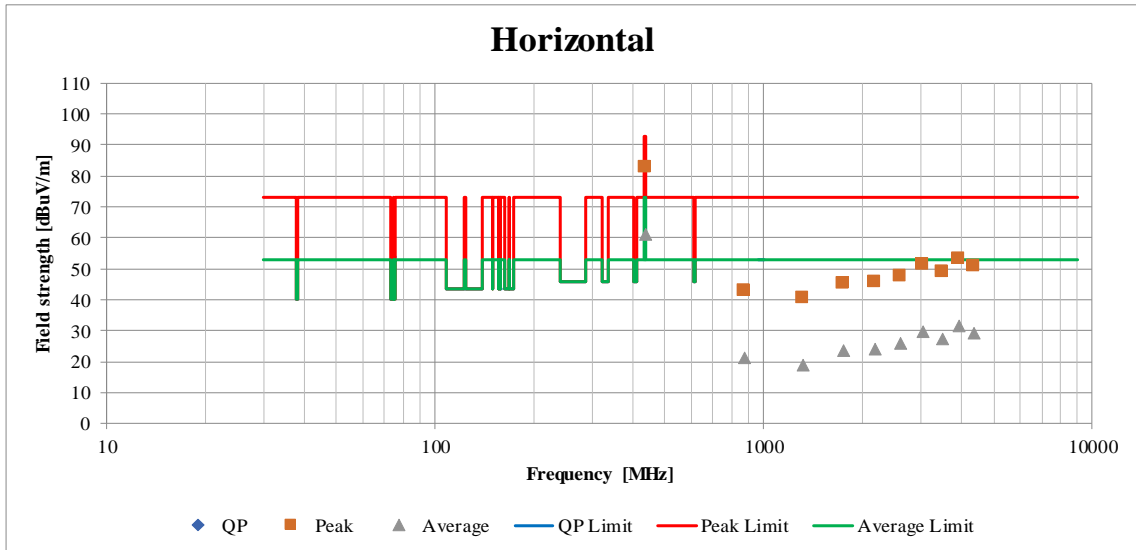
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124



## Radiated Spurious Emission (Plot data, Worst case)

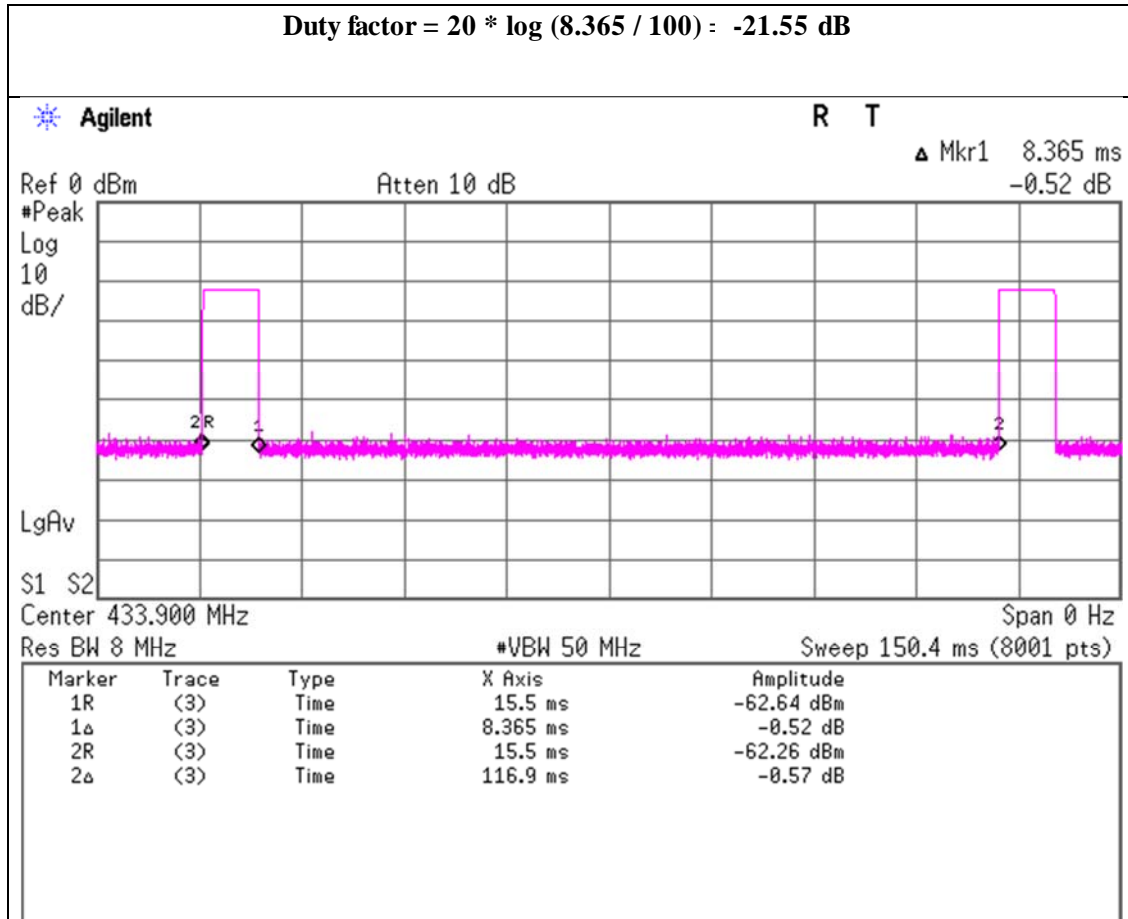
Report No.	13999840H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	October 6, 2021
Temperature / Humidity	24 deg. C / 46 % RH
Engineer	Kiyoshiro Okazaki
Mode	Transmitting mode



## Duty Cycle

Report No. 13999840H  
 Test place Ise EMC Lab.  
 Semi Anechoic Chamber No.3  
 Date October 6, 2021  
 Temperature / Humidity 24 deg. C / 46 % RH  
 Engineer Kiyoshiro Okazaki  
 Mode Transmitting mode

### 433.90 MHz



The ON time (8.365 ms) appears 1 times in 100 ms.  
 The actual measurement value was applied as Averaging factor (Duty factor).

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**-20 dB Bandwidth and 99% Occupied Bandwidth**

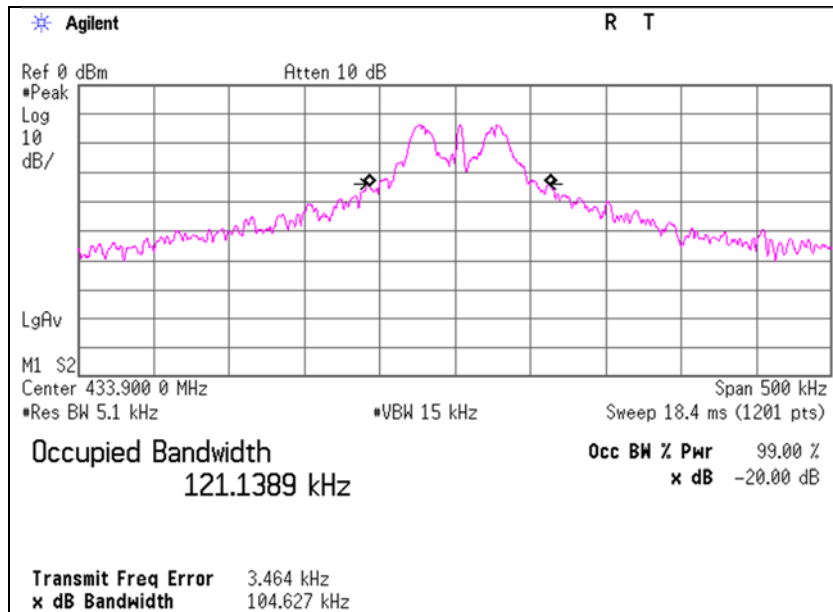
Report No. 13999840H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.3  
Date October 6, 2021  
Temperature / Humidity 24 deg. C / 46 % RH  
Engineer Kiyoshiro Okazaki  
Mode Transmitting mode

Bandwidth Limit : Fundamental Frequency **433.90** MHz x 0.25% = 1084.75 kHz

\* The above limit was calculated from more stringent nominal frequency.

-20dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
104.627	1084.75	Pass

99% Occupied Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
121.1389	1084.75	Pass



## **APPENDIX 2: Test instruments**

### **Test equipment (Test date: October 6, 2021)**

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MLPA-07	142645	Loop Antenna	UL Japan	-	-	-	-
RE	MOS-28	141567	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0008	01/15/2021	12
RE	MMM-17	141557	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	70900530	01/07/2021	12
RE	MSA-13	141900	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46185823	09/30/2021	12
RE	MAEC-03	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/22/2020	24
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1301	01/15/2021	12
RE	MMM-08	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201197	01/07/2021	12
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-ME MI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-03-SVSWR	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/01/2021	24
RE	MAT-95	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	06/09/2021	12
RE	MBA-03	141424	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+BBA9106	1915	08/21/2021	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	07/19/2021	12
RE	MLA-22	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-191	08/21/2021	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/18/2021	12
RE	MTR-08	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/05/2021	12
RE	MSA-03	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	03/10/2021	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	10/01/2020	12
RE	MPA-11	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/03/2021	12
RE	MCC-231	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/1902S579(5m)	03/04/2021	12
RE	MHF-27	141297	High Pass Filter (1.1-10GHz)	TOKYO KEIKI	TF219CD1	1001	01/14/2021	12
RE	MOS-14	141561	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1401	01/15/2021	12
RE	MMM-18	141558	Digital Tester(TRUE RMS MULTIMETER)	Fluke Corporation	115	17930030	05/24/2021	12
RE	MSA-16	141903	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186390	12/18/2020	12
RE	MLPA-08	202511	Loop Antenna	UL Japan	-	-	-	-

\*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:

RE: Radiated emission, 99 % Occupied Bandwidth, -20 dB bandwidth, and Automatically deactivate tests

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**Test equipment (Test date: November 25, 2021)**

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MLPA-07	142645	Loop Antenna	UL Japan	-	-	-	-
RE	MOS-24	90289	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0005	01/15/2021	12
RE	MBM-10	141345	Barometer	Sunoh	SBR121	832	12/11/2019	36
RE	MSA-03	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	03/10/2021	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:

RE: Automatically deactivate tests