

RADIO TEST REPORT

Test Report No. 15632803H-A-R2

Customer	Pacific Industrial Company, LTD.
Description of EUT	TPMS (Tire Pressure Monitoring System Transmitter)
Model Number of EUT	PMV-E209
FCC ID	PAXPMVE209
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied
Issue Date	May 15, 2025
Remarks	-

Representative test engineerTetsuro Yoshida
Engineer**Approved by**Shinichi Miyazono
Leader

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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- The information provided by the customer for this report is identified in SECTION 1.
- The laboratory is not responsible for information provided by the customer which can impact the validity of the results.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No. 15632803H-A

This report is a revised version of 15632803H-A-R1. 15632803H-A-R1 is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15632803H-A	March 13, 2025	-
1	15632803H-A-R1	April 24, 2025	Deletion of the Antenna Gain from Radio Specification in Clause 2.2.
1	15632803H-A-R1	April 24, 2025	Addition of the following sentence in Clause 2.2; *ASK and FSK do not transmit simultaneously.
1	15632803H-A-R1	April 24, 2025	Correction of the Remarks for Mode 5 and 6 in Clause 4.1.
1	15632803H-A-R1	April 24, 2025	Correction of the Modulation description for Mode 5 and 6 in Automatically deactivate test data.
1	15632803H-A-R1	April 24, 2025	Correction of the OBW waveform data for -20 dB Bandwidth / 99% emission bandwidth test
1	15632803H-A-R1	April 24, 2025	Correction of the following items due to retesting for Automatically deactivate test (Mode 3 and 4) - Clause 2.2: Test Date - APPENDIX 1: Test Data - APPENDIX 2: Test Instruments
1	15632803H-A-R2	May 15, 2025	Correction of the Specification for ISED in Clause 3.2.

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	Pacific Industrial Company, LTD.
Address	1300-1, Yokoi, Godo-cho, Anpachi-gun, Gifu 503-2397, Japan
Telephone Number	+81-584-28-0111
Contact Person	Kunitaka Yano

The information provided by 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

SECTION 2: Equipment Under Test (EUT)

2.1 Identification of EUT

Description	TPMS (Tire Pressure Monitoring System Transmitter)
Model Number	PMV-E209
Serial Number	Refer to SECTION 4.2
Condition	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	February 3, 2025
Test Date	February 4 to April 23, 2025

2.2 Product Description

General Specification

Rating	DC 3 V
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Radio Specification

Equipment Type	Transmitter
Frequency of Operation	315.00 MHz, 433.92 MHz
Type of Modulation	ASK, FSK (Deviation: 20 kHz, 25 kHz, 30 kHz, 35 kHz, 40 kHz, 50 kHz)

*ASK and FSK do not transmit simultaneously.

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C The latest version on the first day of the testing period
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 ISED: RSS-Gen 8.8	FCC: Section 15.207 ISED: RSS-Gen 8.8	N/A	N/A	*1)
Automatically Deactivate	FCC: ANSI C63.10:2013 6 Standard test methods ISED: -	FCC: Section 15.231(a)(2) Section 15.231(e) ISED: RSS-210 A1.2 b RSS-210 A1.5 b	N/A	Complied	Radiated
Electric Field Strength of Fundamental Emission	FCC: ANSI C63.10:2013 6 Standard test methods ISED: RSS-Gen 6.12	FCC: Section 15.231(e) ISED: RSS-210 A1.5 c	5.9 dB 315.000 MHz Horizontal, AV	Complied	Radiated
Electric Field Strength of Spurious Emission	FCC: ANSI C63.10:2013 6 Standard test methods ISED: RSS-Gen 6.13	FCC: Section 15.205 Section 15.209 Section 15.231(b) Section 15.231(e) ISED: RSS-210 A1.5 d RSS-Gen 8.9	6.5 dB 3037.440 MHz Horizontal / Vertical, AV	Complied	Radiated
-20 dB Bandwidth	FCC: ANSI C63.10:2013 6 Standard test methods ISED: -	FCC: Section 15.231(c) ISED: Reference data	N/A	Complied	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593. *1) The test is not applicable since the EUT does not have AC Mains.					

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% emission bandwidth	ANSI C63.10:2013 6 Standard test methods	Reference data	N/A	-	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593. Other than above, 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 $k = 2$.

Radiated emission

Measurement distance	Frequency range		Unit	Calculated Uncertainty (+/-)
3 m	9 kHz to 30 MHz		dB	3.3
10 m			dB	3.1
3 m	30 MHz to 200 MHz	Horizontal	dB	5.0
		Vertical	dB	5.0
	200 MHz to 1000 MHz	Horizontal	dB	5.2
		Vertical	dB	6.2
10 m	30 MHz to 200 MHz	Horizontal	dB	5.5
		Vertical	dB	5.4
	200 MHz to 1000 MHz	Horizontal	dB	5.5
		Vertical	dB	5.5
3 m	1 GHz to 6 GHz		dB	5.1
	6 GHz to 18 GHz		dB	5.4
1 m	10 GHz to 18 GHz		dB	5.4
	18 GHz to 26.5 GHz		dB	5.3
	26.5 GHz to 40 GHz		dB	4.8
0.5 m	26.5 GHz to 40 GHz		dB	5.0

Automatically deactivate, -20 dB Bandwidth and 99% Occupied Bandwidth

Item	Unit	Calculated Uncertainty (+/-)
Bandwidth (OBW)	%	0.96
Time readout (time span upto 100 msec)	%	0.11
Time readout (time span upto 1000 msec)	%	0.11
Time readout (time span upto 60 sec)	%	0.02

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

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

Telephone: +81-596-24-8999

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

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

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	-	-

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)

Test mode	Remarks ^{*1)}
1) Rotating and Pressure alert mode 1	FSK (Deviation: 20 kHz, 50 kHz)
2) Rotating and Pressure alert mode 2	ASK
3) Stationary mode 1	FSK (Deviation: 20 kHz, 50 kHz)
4) Stationary mode 2	ASK
5) Learn mode 1	ASK + FSK (Deviation: 20 kHz, 50 kHz)
6) Learn mode 2	ASK + FSK (Deviation: 20 kHz, 50 kHz)
7) Learn mode 3	FSK (Deviation: 20 kHz, 50 kHz) *Only 433.92 MHz
8) Transmitting mode ^{*2)}	FSK (Deviation: 20 kHz, 50 kHz) / ASK
* The system was configured in typical fashion (as a user would normally use it) for testing.	
*Power of the EUT was set by the software as follows; Software: ExAP_SP_V000C (Date: 2025.01.24, Storage location: EUT memory)	
*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.	
Justification: The system was configured in typical fashion (as a user would normally use it) for testing.	

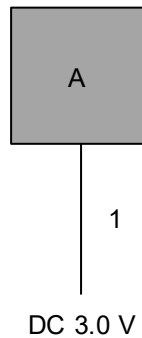
*1) The test was performed with the minimum (20 kHz) and maximum (50 kHz) as representative since there was no difference in performance at pre-check.

*2) The software of this mode is the same as one of normal product, except that EUT continues to transmit.

*The Details of Operating Mode(s)

Test Item	Operating Mode	Tested Frequency
Automatically Deactivate	Mode 1, 2, 3, 4, 5, 6	315.00 MHz 433.92 MHz
	Mode 7	433.92 MHz
Average Output Power, Electric Field Strength of Fundamental Emission, Electric Field Strength of Spurious Emission, -20 dB Bandwidth / 99% emission bandwidth	Mode 8	315.00 MHz 433.92 MHz
Duty Cycle	Mode 5, 8	315.00 MHz
	Mode 5, 7	433.92 MHz

4.2 Configuration and Peripherals



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

Description of EUT

No.	Item	Model number	Serial Number	Manufacturer	Remark
A	TPMS (Tire Pressure Monitoring System Transmitter)	PMV-E209	E5F *1) E60 *2) E5E *3)	Pacific Industrial Company, LTD.	EUT

*1) Used for other tests (315.00 MHz) except for Radiated Emission test.

*2) Used for other tests (433.92 MHz) except for Radiated Emission test.

*3) Used for Radiated Emission test.

List of Cables Used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	1.3	Unshielded	Unshielded	*4)

*4) Used for other tests except for Radiated Emission test.

SECTION 5: Radiated Spurious Emission

Test Procedure

[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, 1.0 m by 1.5 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.

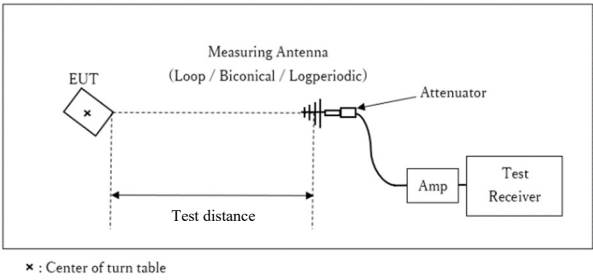
The radiated emission measurements were made with the following detector function of the test receiver / spectrum analyzer.

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

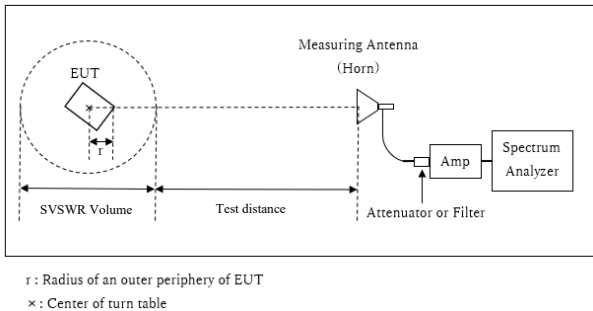
Frequency	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz	Above 1 GHz
Detector Type	Peak	Peak	Peak	Peak	Peak and Peak with Duty factor	Peak and Peak with Duty factor
IF Bandwidth	200 Hz	200 Hz	9.1 kHz	9.1 kHz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

[Test Setup]
Below 1 GHz



Test Distance: 3 m

Mode 8 (315.00 MHz)
1 GHz to 3.2 GHz

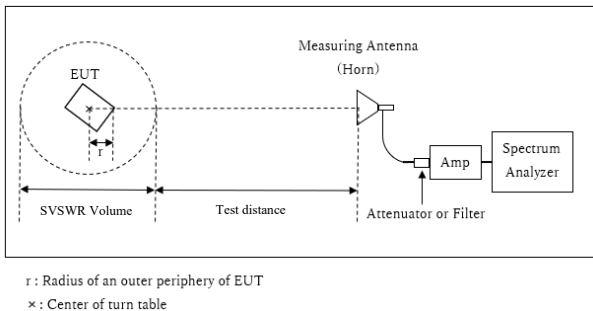


Distance Factor: $20 \times \log (4.0 \text{ m}^* / 3.0 \text{ m}) = 2.50 \text{ dB}$
*(Test Distance + SVSWR Volume / 2) - r = 4.0 m

Test Distance: 3 m
SVSWR Volume: 2 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r: 0.0 m

(The test was performed with r = 0.0 m since EUT is small and it was the rather conservative condition.)

Mode 8 (433.92 MHz)
1 GHz to 4.4 GHz



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

Test Distance: 3 m
SVSWR Volume: 2 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r: 0.0 m

(The test was performed with r = 0.0 m since EUT is small and it was the rather conservative condition.)

- 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.

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

Measurement range : 9 kHz to 3.2 GHz (Mode 8 (315.00 MHz))
 9 kHz to 4.4 GHz (Mode 8 (433.92 MHz))
Test data : APPENDIX
Test result : Pass

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 Bandwidth and 99% emission 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% emission 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) Peak hold was applied as Worst-case measurement.							

Test data : APPENDIX
Test result : Pass

SECTION 8: Average Output Power

Test Procedure

Average Output Power was measured with a Power Meter to measure Burst Average.
The test data is reference data for RF Exposure.

Test data : APPENDIX

APPENDIX 1: Test Data

Automatically deactivate

Test place	Ise EMC Lab.	No.8
Measurement room	No.8	No.8
Date	February 4, 2025	April 23, 2025
Temperature / Humidity	22 deg. C / 45 % RH	22 deg. C / 41 % RH
Engineer	Tetsuro Yoshida	Ken Fujita
Mode	Mode 1 and 2	Mode 3 and 4

Applied clause FCC 15.231(e)

Freq. [MHz]	Mode	Modulation	Each transmission duration [sec]	Limit for maximum transmission duration [sec]	Result	Interval [sec]	Silent period [sec]	Limit for minimum silent period [sec]
315.00	1	FSK 20 kHz	0.3928	1.000	Pass	16.02	15.627	11.78
315.00	1	FSK 50 kHz	0.3926	1.000	Pass	16.35	15.957	11.77
315.00	2	ASK	0.4247	1.000	Pass	16.02	15.595	12.74
433.92	1	FSK 20 kHz	0.3928	1.000	Pass	16.42	16.027	11.78
433.92	1	FSK 50 kHz	0.3928	1.000	Pass	15.99	15.597	11.78
433.92	2	ASK	0.4244	1.000	Pass	16.30	15.876	12.73
315.00	3	FSK 20 kHz	0.0233	1.000	Pass	255.70	255.677	0.7
315.00	3	FSK 50 kHz	0.0235	1.000	Pass	257.50	257.477	0.7
315.00	4	ASK	0.0313	1.000	Pass	258.60	258.569	0.93
433.92	3	FSK 20 kHz	0.0233	1.000	Pass	257.40	257.377	0.7
433.92	3	FSK 50 kHz	0.0233	1.000	Pass	257.20	257.177	0.7
433.92	4	ASK	0.0313	1.000	Pass	255.90	255.869	0.93

Silent period = interval – each transmission duration

Limit for minimum silent period = each transmission duration * 30, in no case less than 10 seconds.

Automatically deactivate

Test place Ise EMC Lab.
Measurement room No.8
Date February 4, 2025
Temperature / Humidity 22 deg. C / 45 % RH
Engineer Tetsuro Yoshida
Mode Mode 1 and 2

315.00 MHz Rotating and Pressure alert mode1 and 2



Automatically deactivate

Test place Ise EMC Lab.
Measurement room No.8
Date February 4, 2025
Temperature / Humidity 22 deg. C / 45 % RH
Engineer Tetsuro Yoshida
Mode Mode 1 and 2

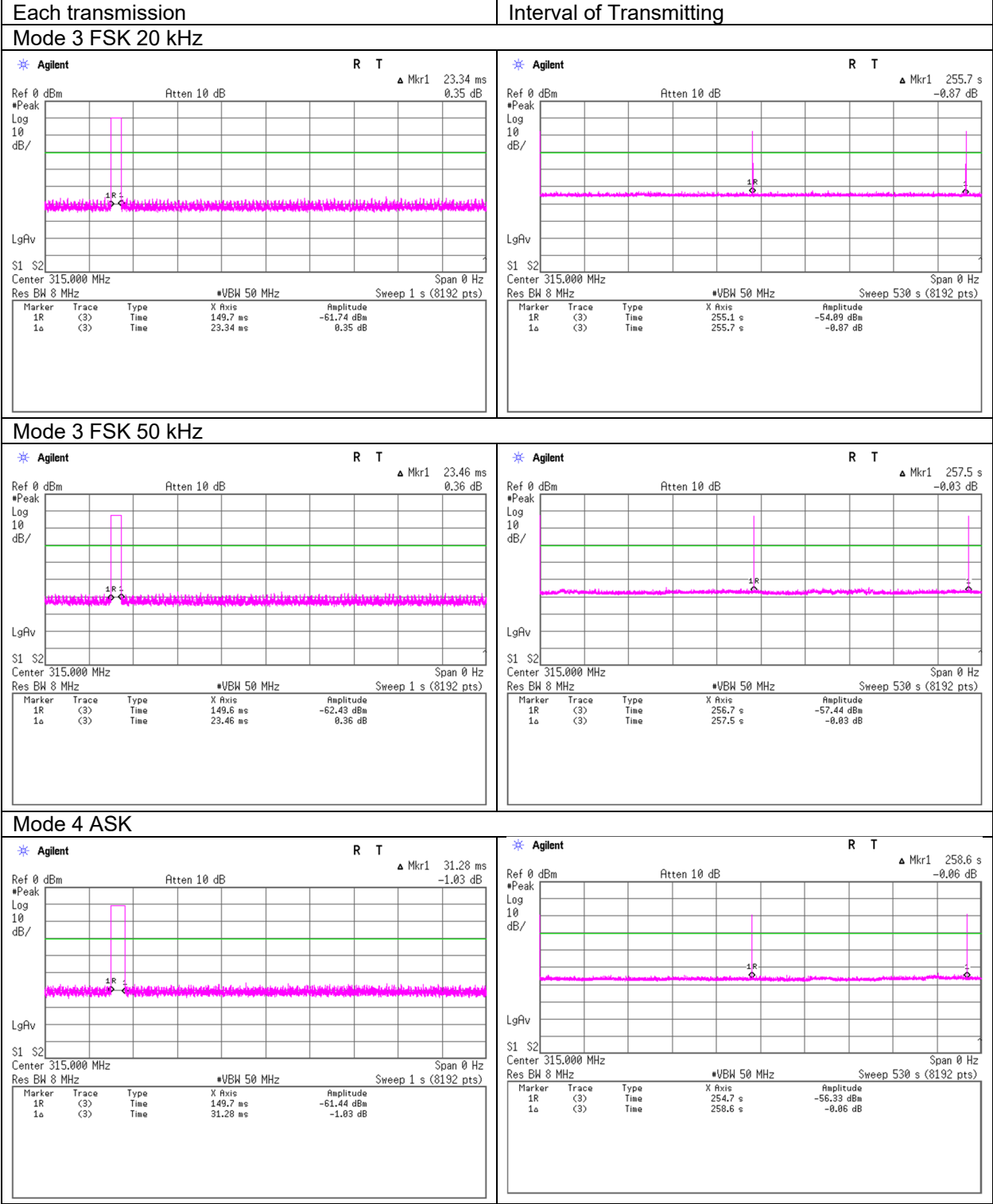
433.92 MHz Rotating and Pressure alert mode1 and 2



Automatically deactivate

Test place Ise EMC Lab.
Measurement room No.8
Date April 23, 2025
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Ken Fujita
Mode Mode 3 and 4

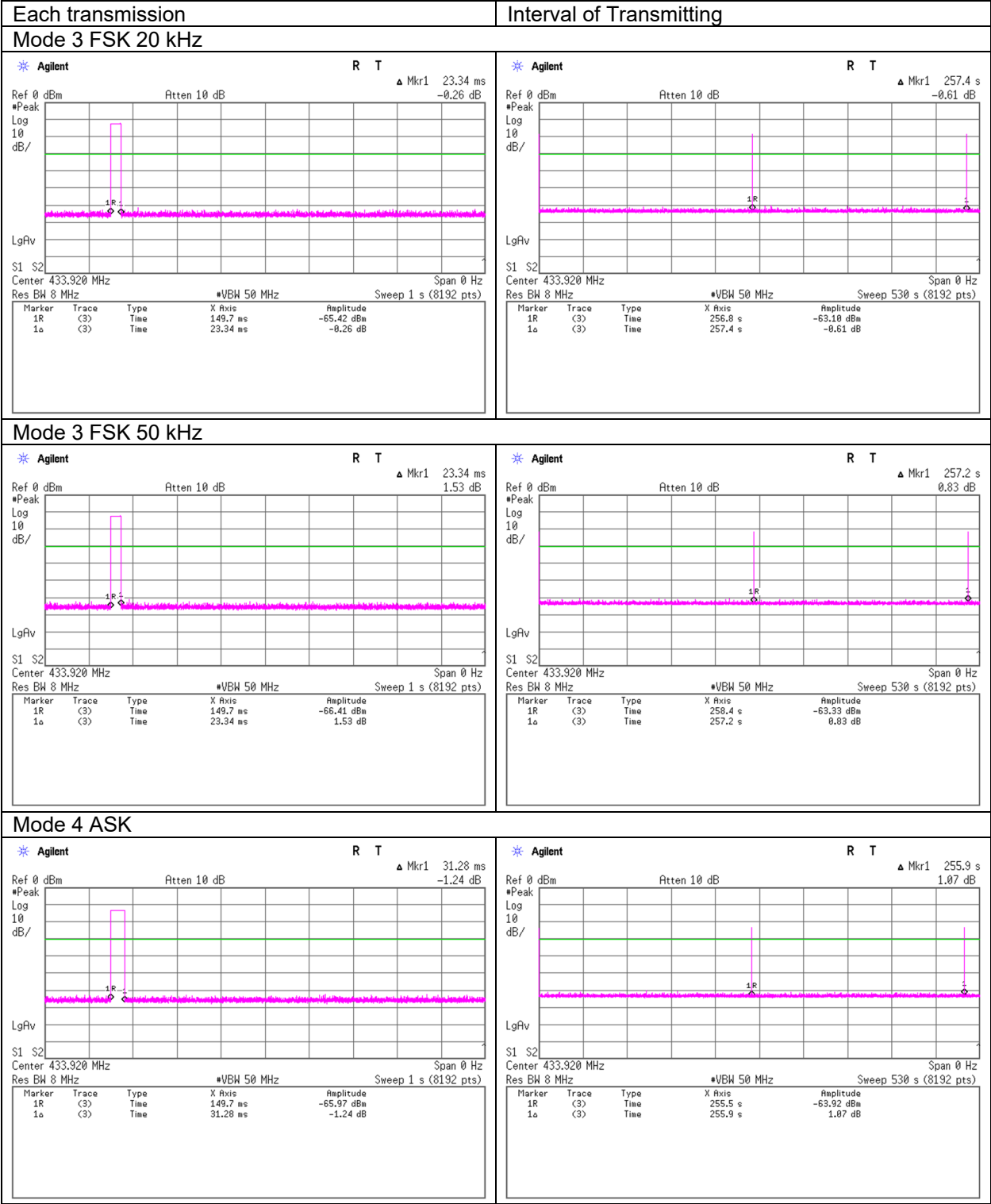
315.00 MHz Stationary mode 1 and 2



Automatically deactivate

Test place Ise EMC Lab.
Measurement room No.8
Date April 23, 2025
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Ken Fujita
Mode Mode 3 and 4

433.92 MHz Stationary mode 1 and 2



Automatically deactivate

Test place Ise EMC Lab.
Measurement room No.8
Date February 4, 2025
Temperature / Humidity 22 deg. C / 45 % RH
Engineer Tetsuro Yoshida
Mode Mode 5, 6 and 7

Applied clause FCC 15.231(a)(2)

Freq. [MHz]	Mode	Modulation	Time of Transmitting [sec]	Limit [sec]	Result
315.00	5	ASK + FSK 20 kHz	0.5297	5.00	Pass
315.00	5	ASK + FSK 50 kHz	0.5297	5.00	Pass
315.00	6	ASK + FSK 20 kHz	0.9192	5.00	Pass
315.00	6	ASK + FSK 50 kHz	0.9192	5.00	Pass
433.92	5	ASK + FSK 20 kHz	0.5285	5.00	Pass
433.92	5	ASK + FSK 50 kHz	0.5285	5.00	Pass
433.92	6	ASK + FSK 20 kHz	0.9192	5.00	Pass
433.92	6	ASK + FSK 50 kHz	0.9192	5.00	Pass
433.92	7	FSK 20 kHz	0.5248	5.00	Pass
433.92	7	FSK 50 kHz	0.5261	5.00	Pass

Automatically deactivate

Test place	Ise EMC Lab.
Measurement room	No.8
Date	February 4, 2025
Temperature / Humidity	22 deg. C / 45 % RH
Engineer	Tetsuro Yoshida
Mode	Mode 5, 6 and 7

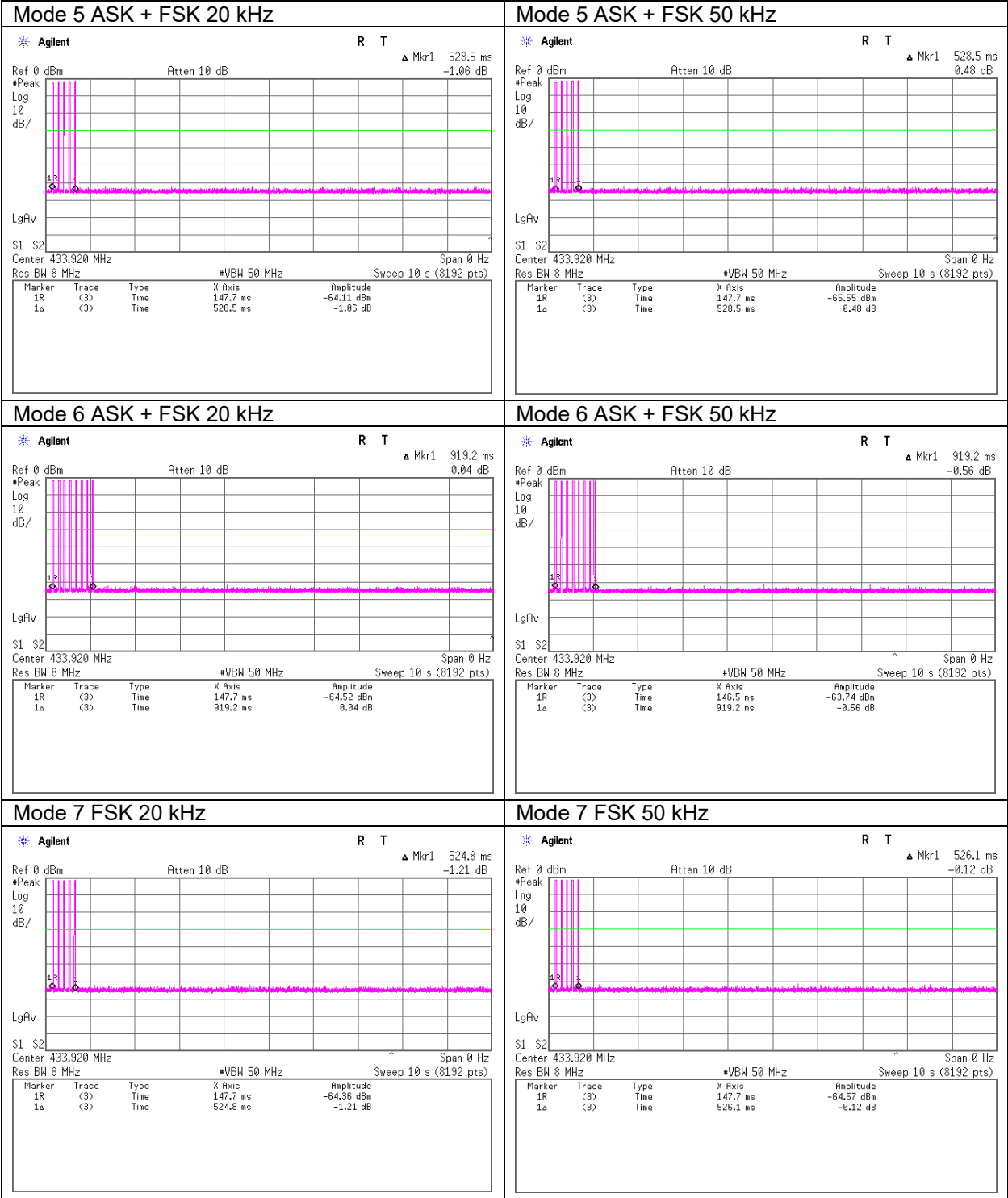
315.00 MHz Learn mode1,2 and 3



Automatically deactivate

Test place Ise EMC Lab.
Measurement room No.8
Date February 4, 2025
Temperature / Humidity 22 deg. C / 45 % RH
Engineer Tetsuro Yoshida
Mode Mode 5, 6 and 7

433.92 MHz Learn mode1,2 and 3



Average Output Power (Reference data for RF Exposure)

Test place	Ise EMC Lab.
Measurement room	No.8
Date	February 6, 2025
Temperature / Humidity	20 deg. C / 40 % RH
Engineer	Tetsuro Yoshida
Mode	Mode 8

Freq. [MHz]	Modulation	Reading (P/M) [dBm]	Atten. Loss [dB]	Conducted Power	
				Result (Burst)	
				[dBm]	[mW]
315.00	ASK	-6.88	9.88	3.00	2.00
315.00	FSK 20 kHz	-2.75	9.88	7.13	5.16
315.00	FSK 50 kHz	-2.75	9.88	7.13	5.16
433.92	ASK	-5.92	9.89	3.97	2.49
433.92	FSK 20 kHz	-1.76	9.89	8.13	6.50
433.92	FSK 50 kHz	-1.76	9.89	8.13	6.50

Sample Calculation:

Conducted Power Result = Reading + Atten. Loss (cable is not used)

*Since Burst Power is higher than Time Average Power, the test was performed at Burst Power to be more conservative.

The measurement of Burst Power used Gate function.

Radiated Emission (Fundamental and Spurious Emission)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2025
Temperature / Humidity	20 deg. C / 35 % RH
Engineer	Tetsuro Yoshida
Mode	Mode 8 / 315.00 MHz

ASK

Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (PK) [dBuV/m]	Result (PK with Duty Factor) [dBuV/m]	Limit (PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (PK) [dB]	Margin (AV) [dB]	Inside or Outside of Restricted Bands	Remarks
Hori.	315.000	79.6	13.9	9.8	32.0	-9.6	71.3	61.7	87.6	67.6	16.3	5.9	Carrier	
Hori.	630.000	46.7	19.5	11.7	32.1	-9.6	45.8	36.2	67.6	47.6	21.8	11.4	Outside	
Hori.	945.000	29.3	22.0	13.2	30.7	-9.6	33.8	24.2	67.6	47.6	33.8	23.4	Outside	
Hori.	1260.000	45.3	25.6	4.5	34.1	-9.6	41.3	31.7	73.9	53.9	32.6	22.2	Outside	
Hori.	1575.000	54.7	25.3	4.7	33.4	-9.6	51.3	41.7	73.9	53.9	22.6	12.2	Inside	
Hori.	1890.000	57.0	25.7	4.8	32.6	-9.6	54.9	45.3	73.9	53.9	19.0	8.6	Outside	
Hori.	2205.000	48.0	28.2	4.9	32.3	-9.6	48.8	39.2	73.9	53.9	25.1	14.7	Inside	
Hori.	2520.000	46.1	27.4	5.0	32.2	-9.6	46.3	36.7	73.9	53.9	27.6	17.2	Outside	
Hori.	2835.000	50.0	28.5	5.2	32.0	-9.6	51.7	42.1	73.9	53.9	22.2	11.8	Inside	
Hori.	3150.000	52.7	28.8	5.3	31.9	-9.6	54.9	45.3	73.9	53.9	19.0	8.6	Outside	
Vert.	315.000	76.1	13.9	9.8	32.0	-9.6	67.8	58.2	87.6	67.6	19.8	9.4	Carrier	
Vert.	630.000	47.0	19.5	11.7	32.1	-9.6	46.1	36.5	67.6	47.6	21.5	11.1	Outside	
Vert.	945.000	32.6	22.0	13.2	30.7	-9.6	37.1	27.5	67.6	47.6	30.5	20.1	Outside	
Vert.	1260.000	45.9	25.6	4.5	34.1	-9.6	41.9	32.3	73.9	53.9	32.0	21.6	Outside	
Vert.	1575.000	53.9	25.3	4.7	33.4	-9.6	50.5	40.9	73.9	53.9	23.4	13.0	Inside	
Vert.	1890.000	56.9	25.7	4.8	32.6	-9.6	54.8	45.2	73.9	53.9	19.1	8.7	Outside	
Vert.	2205.000	47.6	28.2	4.9	32.3	-9.6	48.4	38.8	73.9	53.9	25.5	15.1	Inside	
Vert.	2520.000	46.2	27.4	5.0	32.2	-9.6	46.4	36.8	73.9	53.9	27.5	17.1	Outside	
Vert.	2835.000	49.9	28.5	5.2	32.0	-9.6	51.6	42.0	73.9	53.9	22.3	11.9	Inside	
Vert.	3150.000	52.7	28.8	5.3	31.9	-9.6	54.9	45.3	73.9	53.9	19.0	8.6	Outside	

Sample calculation:

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

Result of PK with Duty factor (PK / W) = 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 1 GHz: 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).

Radiated Emission (Fundamental and Spurious Emission)

Test place	Ise EMC Lab.	No.3
Semi Anechoic Chamber	No.3	No.3
Date	February 10, 2025	February 11, 2025
Temperature / Humidity	20 deg. C / 37 % RH	18 deg. C / 35 % RH
Engineer	Hiroyuki Furutaka	Hiroyuki Furutaka
	(Above 1 GHz)	(Below 1 GHz)
Mode	Mode 8 / 315.00 MHz	

FSK, Deviation 20 kHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (PK) [dBuV/m]	Result (PK with Duty Factor) [dBuV/m]	Limit (PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (PK) [dB]	Margin (AV) [dB]	Inside or Outside of Restricted Bands	Remarks
Hori.	315.000	80.3	13.9	9.8	32.0	-12.7	72.0	59.3	87.6	67.6	15.6	8.3	Carrier	
Hori.	630.000	47.5	19.5	11.7	32.1	-12.7	46.6	33.9	67.6	47.6	21.0	13.7	Outside	
Hori.	945.000	31.0	22.0	13.2	30.7	-12.7	35.5	22.8	67.6	47.6	32.1	24.8	Outside	
Hori.	1260.000	46.4	25.6	4.5	34.1	-12.7	42.4	29.7	73.9	53.9	31.5	24.2	Outside	
Hori.	1575.000	54.5	25.3	4.7	33.4	-12.7	51.1	38.4	73.9	53.9	22.8	15.5	Inside	
Hori.	1890.000	57.7	25.7	4.8	32.6	-12.7	55.6	42.9	73.9	53.9	18.3	11.0	Outside	
Hori.	2205.000	48.0	28.2	4.9	32.3	-12.7	48.8	36.1	73.9	53.9	25.1	17.8	Inside	
Hori.	2520.000	46.3	27.4	5.0	32.2	-12.7	46.5	33.8	73.9	53.9	27.4	20.1	Outside	
Hori.	2835.000	51.1	28.5	5.2	32.0	-12.7	52.8	40.1	73.9	53.9	21.1	13.8	Inside	
Hori.	3150.000	54.1	28.8	5.3	31.9	-12.7	56.3	43.6	73.9	53.9	17.6	10.3	Outside	
Vert.	315.000	77.4	13.9	9.8	32.0	-12.7	69.1	56.4	87.6	67.6	18.5	11.2	Carrier	
Vert.	630.000	47.6	19.5	11.7	32.1	-12.7	46.7	34.0	67.6	47.6	20.9	13.6	Outside	
Vert.	945.000	32.7	22.0	13.2	30.7	-12.7	37.2	24.5	67.6	47.6	30.4	23.1	Outside	
Vert.	1260.000	46.0	25.6	4.5	34.1	-12.7	42.0	29.3	73.9	53.9	31.9	24.6	Outside	
Vert.	1575.000	53.5	25.3	4.7	33.4	-12.7	50.1	37.4	73.9	53.9	23.8	16.5	Inside	
Vert.	1890.000	57.4	25.7	4.8	32.6	-12.7	55.3	42.6	73.9	53.9	18.6	11.3	Outside	
Vert.	2205.000	48.5	28.2	4.9	32.3	-12.7	49.3	36.6	73.9	53.9	24.6	17.3	Inside	
Vert.	2520.000	46.4	27.4	5.0	32.2	-12.7	46.6	33.9	73.9	53.9	27.3	20.0	Outside	
Vert.	2835.000	50.0	28.5	5.2	32.0	-12.7	51.7	39.0	73.9	53.9	22.2	14.9	Inside	
Vert.	3150.000	53.9	28.8	5.3	31.9	-12.7	56.1	43.4	73.9	53.9	17.8	10.5	Outside	

FSK, Deviation 50 kHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (PK) [dBuV/m]	Result (PK with Duty Factor) [dBuV/m]	Limit (PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (PK) [dB]	Margin (AV) [dB]	Inside or Outside of Restricted Bands	Remarks
Hori.	315.000	80.4	13.9	9.8	32.0	-12.7	72.1	59.4	87.6	67.6	15.5	8.2	Carrier	
Hori.	630.000	47.6	19.5	11.7	32.1	-12.7	46.7	34.0	67.6	47.6	20.9	13.6	Outside	
Hori.	945.000	30.0	22.0	13.2	30.7	-12.7	34.5	21.8	67.6	47.6	33.1	25.8	Outside	
Hori.	1260.000	47.0	25.6	4.5	34.1	-12.7	43.0	30.3	73.9	53.9	30.9	23.6	Outside	
Hori.	1575.000	54.6	25.3	4.7	33.4	-12.7	51.2	38.5	73.9	53.9	22.7	15.4	Inside	
Hori.	1890.000	58.0	25.7	4.8	32.6	-12.7	55.9	43.2	73.9	53.9	18.0	10.7	Outside	
Hori.	2205.000	48.2	28.2	4.9	32.3	-12.7	49.0	36.3	73.9	53.9	24.9	17.6	Inside	
Hori.	2520.000	45.7	27.4	5.0	32.2	-12.7	45.9	33.2	73.9	53.9	28.0	20.7	Outside	
Hori.	2835.000	50.8	28.5	5.2	32.0	-12.7	52.5	39.8	73.9	53.9	21.4	14.1	Inside	
Hori.	3150.000	54.2	28.8	5.3	31.9	-12.7	56.4	43.7	73.9	53.9	17.5	10.2	Outside	
Vert.	315.000	77.5	13.9	9.8	32.0	-12.7	69.2	56.5	87.6	67.6	18.4	11.1	Carrier	
Vert.	630.000	47.6	19.5	11.7	32.1	-12.7	46.7	34.0	67.6	47.6	20.9	13.6	Outside	
Vert.	945.000	32.9	22.0	13.2	30.7	-12.7	37.4	24.7	67.6	47.6	30.2	22.9	Outside	
Vert.	1260.000	46.6	25.6	4.5	34.1	-12.7	42.6	29.9	73.9	53.9	31.3	24.0	Outside	
Vert.	1575.000	54.0	25.3	4.7	33.4	-12.7	50.6	37.9	73.9	53.9	23.3	16.0	Inside	
Vert.	1890.000	57.8	25.7	4.8	32.6	-12.7	55.7	43.0	73.9	53.9	18.2	10.9	Outside	
Vert.	2205.000	48.7	28.2	4.9	32.3	-12.7	49.5	36.8	73.9	53.9	24.4	17.1	Inside	
Vert.	2520.000	45.2	27.4	5.0	32.2	-12.7	45.4	32.7	73.9	53.9	28.5	21.2	Outside	
Vert.	2835.000	50.5	28.5	5.2	32.0	-12.7	52.2	39.5	73.9	53.9	21.7	14.4	Inside	
Vert.	3150.000	53.7	28.8	5.3	31.9	-12.7	55.9	43.2	73.9	53.9	18.0	10.7	Outside	

Sample calculation:

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

Result of PK with Duty factor (PK / W) = 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 1 GHz: 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).

Radiated Emission (Fundamental and Spurious Emission)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2025
Temperature / Humidity	20 deg. C / 35 % RH
Engineer	Tetsuro Yoshida
Mode	Mode 8 / 433.92 MHz

ASK

Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (PK) [dBuV/m]	Result (PK with Duty Factor) [dBuV/m]	Limit (PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (PK) [dB]	Margin (AV) [dB]	Inside or Outside of Restricted Bands	Remarks
Hori.	433.920	77.2	16.2	10.6	32.0	-9.6	72.0	62.4	92.8	72.8	20.8	10.4	Carrier	
Hori.	867.840	32.3	21.9	12.9	31.2	-9.6	35.9	26.3	72.8	52.8	36.9	26.5	Outside	
Hori.	1301.760	53.7	25.7	4.6	34.0	-9.6	50.0	40.4	73.9	53.9	23.9	13.5	Inside	
Hori.	1735.680	55.7	25.1	4.7	33.0	-9.6	52.5	42.9	73.9	53.9	21.4	11.0	Outside	
Hori.	2169.600	49.0	28.0	4.9	32.3	-9.6	49.6	40.0	73.9	53.9	24.3	13.9	Outside	
Hori.	2603.520	50.2	27.6	5.1	32.1	-9.6	50.8	41.2	73.9	53.9	23.1	12.7	Outside	
Hori.	3037.440	54.4	28.7	5.3	32.0	-9.6	56.4	46.8	73.9	53.9	17.5	7.1	Outside	
Hori.	3471.360	53.1	28.8	5.5	31.7	-9.6	55.7	46.1	73.9	53.9	18.2	7.8	Outside	
Hori.	3905.280	50.2	29.8	5.7	31.5	-9.6	54.2	44.6	73.9	53.9	19.7	9.3	Inside	
Hori.	4339.200	44.2	30.6	5.8	31.4	-9.6	49.2	39.6	73.9	53.9	24.7	14.3	Inside	
Vert.	433.920	78.7	16.2	10.6	32.0	-9.6	73.5	63.9	92.8	72.8	19.3	8.9	Carrier	
Vert.	867.840	31.1	21.9	12.9	31.2	-9.6	34.7	25.1	72.8	52.8	38.1	27.7	Outside	
Vert.	1301.760	52.7	25.7	4.6	34.0	-9.6	49.0	39.4	73.9	53.9	24.9	14.5	Inside	
Vert.	1735.680	55.3	25.1	4.7	33.0	-9.6	52.1	42.5	73.9	53.9	21.8	11.4	Outside	
Vert.	2169.600	50.9	28.0	4.9	32.3	-9.6	51.5	41.9	73.9	53.9	22.4	12.0	Outside	
Vert.	2603.520	50.7	27.6	5.1	32.1	-9.6	51.3	41.7	73.9	53.9	22.6	12.2	Outside	
Vert.	3037.440	54.4	28.7	5.3	32.0	-9.6	56.4	46.8	73.9	53.9	17.5	7.1	Outside	
Vert.	3471.360	49.2	28.8	5.5	31.7	-9.6	51.8	42.2	73.9	53.9	22.1	11.7	Outside	
Vert.	3905.280	48.7	29.8	5.7	31.5	-9.6	52.7	43.1	73.9	53.9	21.2	10.8	Inside	
Vert.	4339.200	44.2	30.6	5.8	31.4	-9.6	49.2	39.6	73.9	53.9	24.7	14.3	Inside	

Sample calculation:

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

Result of PK with Duty factor (PK / W) = 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 1 GHz: 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).

Radiated Emission (Fundamental and Spurious Emission)

Test place	Ise EMC Lab.	No.3
Semi Anechoic Chamber	No.3	February 11, 2025
Date	February 10, 2025	February 11, 2025
Temperature / Humidity	20 deg. C / 37 % RH	18 deg. C / 35 % RH
Engineer	Hiroyuki Furutaka	Hiroyuki Furutaka
	(Above 1 GHz)	(Below 1 GHz)
Mode	Mode 8 / 433.92 MHz	

FSK, Deviation 20 kHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (PK) [dBuV/m]	Result (PK with Duty Factor) [dBuV/m]	Limit (PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (PK) [dB]	Margin (AV) [dB]	Inside or Outside of Restricted Bands	Remarks
Hori.	433.920	77.9	16.2	10.6	32.0	-10.4	72.7	62.3	92.8	72.8	20.1	10.5	Carrier	
Hori.	867.840	32.9	21.9	12.9	31.2	-10.4	36.5	26.1	72.8	52.8	36.3	26.7	Outside	
Hori.	1301.760	54.0	25.7	4.6	34.0	-10.4	50.3	39.9	73.9	53.9	23.6	14.0	Inside	
Hori.	1735.680	56.2	25.1	4.7	33.0	-10.4	53.0	42.6	73.9	53.9	20.9	11.3	Outside	
Hori.	2169.600	51.3	28.0	4.9	32.3	-10.4	51.9	41.5	73.9	53.9	22.0	12.4	Outside	
Hori.	2603.520	50.9	27.6	5.1	32.1	-10.4	51.5	41.1	73.9	53.9	22.4	12.8	Outside	
Hori.	3037.440	55.5	28.7	5.3	32.0	-10.4	57.5	47.1	73.9	53.9	16.4	6.8	Outside	
Hori.	3471.360	53.6	28.8	5.5	31.7	-10.4	56.2	45.8	73.9	53.9	17.7	8.1	Outside	
Hori.	3905.280	51.3	29.8	5.7	31.5	-10.4	55.3	44.9	73.9	53.9	18.6	9.0	Inside	
Hori.	4339.200	45.5	30.6	5.8	31.4	-10.4	50.5	40.1	73.9	53.9	23.4	13.8	Inside	
Vert.	433.920	79.8	16.2	10.6	32.0	-10.4	74.6	64.2	92.8	72.8	18.2	8.6	Carrier	
Vert.	867.840	31.8	21.9	12.9	31.2	-10.4	35.4	25.0	72.8	52.8	37.4	27.8	Outside	
Vert.	1301.760	53.5	25.7	4.6	34.0	-10.4	49.8	39.4	73.9	53.9	24.1	14.5	Inside	
Vert.	1735.680	56.4	25.1	4.7	33.0	-10.4	53.2	42.8	73.9	53.9	20.7	11.1	Outside	
Vert.	2169.600	51.0	28.0	4.9	32.3	-10.4	51.6	41.2	73.9	53.9	22.3	12.7	Outside	
Vert.	2603.520	51.5	27.6	5.1	32.1	-10.4	52.1	41.7	73.9	53.9	21.8	12.2	Outside	
Vert.	3037.440	55.8	28.7	5.3	32.0	-10.4	57.8	47.4	73.9	53.9	16.1	6.5	Outside	
Vert.	3471.360	51.6	28.8	5.5	31.7	-10.4	54.2	43.8	73.9	53.9	19.7	10.1	Outside	
Vert.	3905.280	51.0	29.8	5.7	31.5	-10.4	55.0	44.6	73.9	53.9	18.9	9.3	Inside	
Vert.	4339.200	45.2	30.6	5.8	31.4	-10.4	50.2	39.8	73.9	53.9	23.7	14.1	Inside	

FSK, Deviation 50 kHz

Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (PK) [dBuV/m]	Result (PK with Duty Factor) [dBuV/m]	Limit (PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (PK) [dB]	Margin (AV) [dB]	Inside or Outside of Restricted Bands	Remarks
Hori.	433.920	78.0	16.2	10.6	32.0	-10.4	72.8	62.4	92.8	72.8	20.0	10.4	Carrier	
Hori.	867.840	32.7	21.9	12.9	31.2	-10.4	36.3	25.9	72.8	52.8	36.5	26.9	Outside	
Hori.	1301.760	53.8	25.7	4.6	34.0	-10.4	50.1	39.7	73.9	53.9	23.8	14.2	Inside	
Hori.	1735.680	56.3	25.1	4.7	33.0	-10.4	53.1	42.7	73.9	53.9	20.8	11.2	Outside	
Hori.	2169.600	50.8	28.0	4.9	32.3	-10.4	51.4	41.0	73.9	53.9	22.5	12.9	Outside	
Hori.	2603.520	51.5	27.6	5.1	32.1	-10.4	52.1	41.7	73.9	53.9	21.8	12.2	Outside	
Hori.	3037.440	55.8	28.7	5.3	32.0	-10.4	57.8	47.4	73.9	53.9	16.1	6.5	Outside	
Hori.	3471.360	53.6	28.8	5.5	31.7	-10.4	56.2	45.8	73.9	53.9	17.7	8.1	Outside	
Hori.	3905.280	51.0	29.8	5.7	31.5	-10.4	55.0	44.6	73.9	53.9	18.9	9.3	Inside	
Hori.	4339.200	45.0	30.6	5.8	31.4	-10.4	50.0	39.6	73.9	53.9	23.9	14.3	Inside	
Vert.	433.920	80.0	16.2	10.6	32.0	-10.4	74.8	64.4	92.8	72.8	18.0	8.4	Carrier	
Vert.	867.840	32.0	21.9	12.9	31.2	-10.4	35.6	25.2	72.8	52.8	37.2	27.6	Outside	
Vert.	1301.760	53.9	25.7	4.6	34.0	-10.4	50.2	39.8	73.9	53.9	23.7	14.1	Inside	
Vert.	1735.680	56.2	25.1	4.7	33.0	-10.4	53.0	42.6	73.9	53.9	20.9	11.3	Outside	
Vert.	2169.600	51.1	28.0	4.9	32.3	-10.4	51.7	41.3	73.9	53.9	22.2	12.6	Outside	
Vert.	2603.520	51.6	27.6	5.1	32.1	-10.4	52.2	41.8	73.9	53.9	21.7	12.1	Outside	
Vert.	3037.440	55.4	28.7	5.3	32.0	-10.4	57.4	47.0	73.9	53.9	16.5	6.9	Outside	
Vert.	3471.360	51.3	28.8	5.5	31.7	-10.4	53.9	43.5	73.9	53.9	20.0	10.4	Outside	
Vert.	3905.280	50.9	29.8	5.7	31.5	-10.4	54.9	44.5	73.9	53.9	19.0	9.4	Inside	
Vert.	4339.200	45.0	30.6	5.8	31.4	-10.4	50.0	39.6	73.9	53.9	23.9	14.3	Inside	

Sample calculation:

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

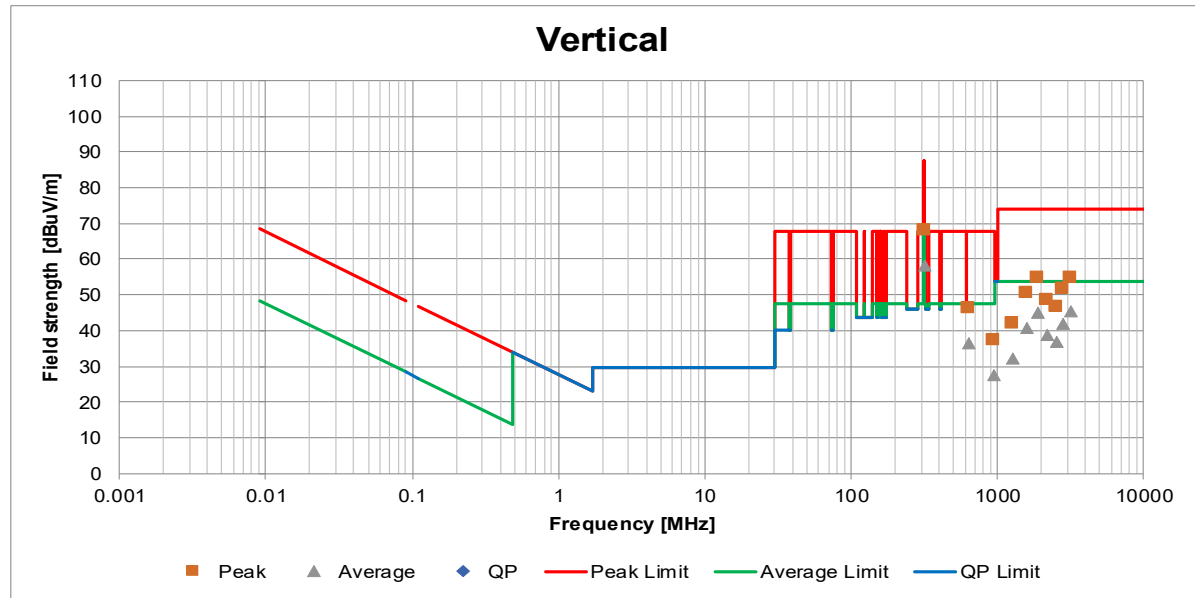
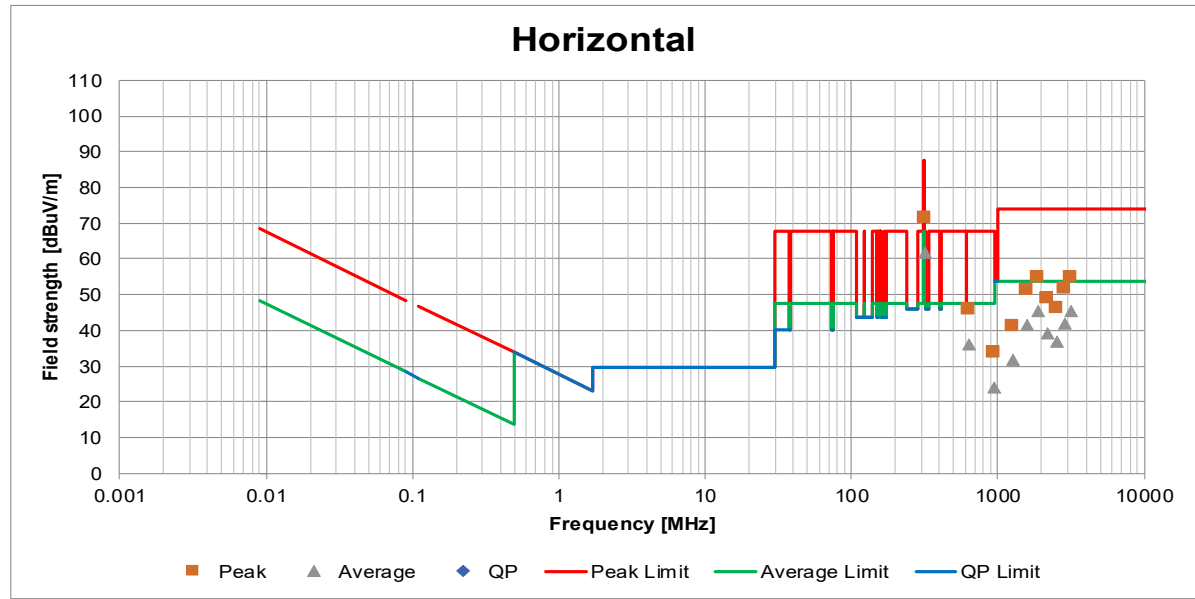
Result of PK with Duty factor (PK / W) = Reading + Ant Factor + Loss {Cable + Attenuator + Filter (above 1 GHz) + Distance factor (above 1 GHz)} - Gain (Amplifier) + Duty factor (Refer to Duty cycle data sheet)

For above 1 GHz: 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).

Radiated Spurious Emission
(Plot data, Worst case for Fundamental Emission)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 12, 2025
Temperature / Humidity	20 deg. C / 35 % RH
Engineer	Tetsuro Yoshida
Mode	Mode 8 / 315.00 MHz / ASK



Duty Cycle

Test place Ise EMC Lab.
Measurement room No.8
Date February 6, 2025
Temperature / Humidity 20 deg. C / 40 % RH
Engineer Tetsuro Yoshida
Mode Mode 5, 7 and 8

315.00 MHz

Mode	ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
ASK	33.1	100	0.3310	-9.6
FSK	23.1	100	0.2310	-12.7

433.92 MHz

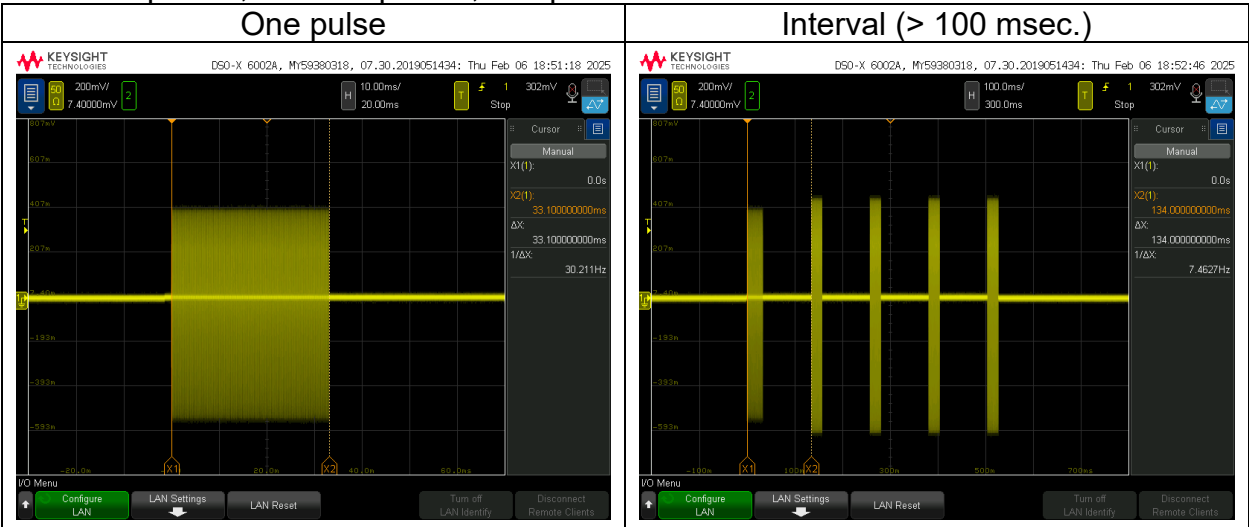
Mode	ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
ASK	33.1	100	0.3310	-9.6
FSK	30.0	100	0.3000	-10.4

ON time[ms] = On Time (in 100 ms)
Duty = $20 * \log_{10}(\text{ON time/Cycle})$

Duty Cycle

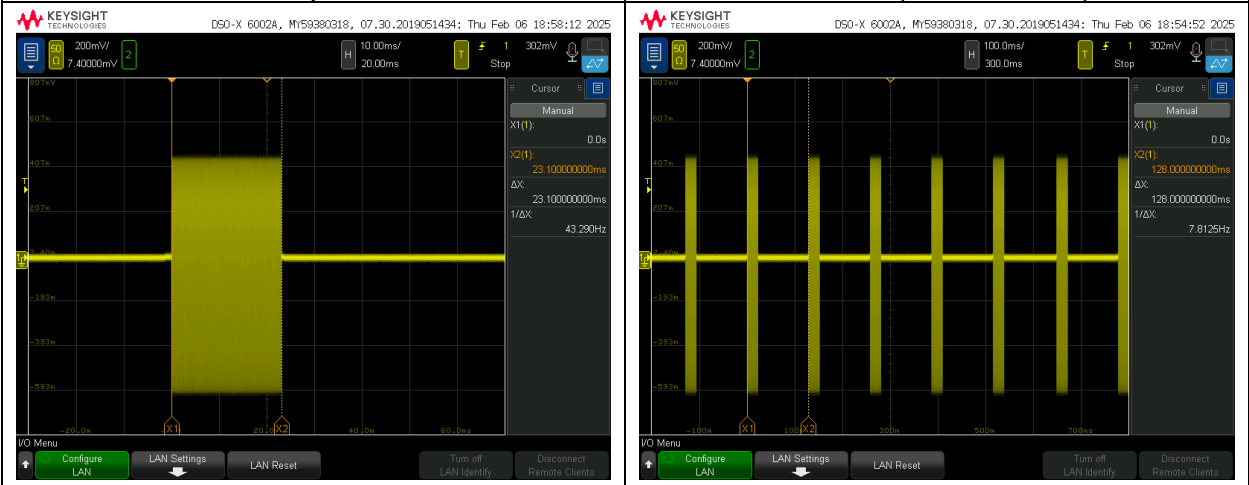
Test place	Ise EMC Lab.
Measurement room	No.8
Date	February 6, 2025
Temperature / Humidity	20 deg. C / 40 % RH
Engineer	Tetsuro Yoshida
Mode	Mode 5 and 8 / 315.00 MHz

ASK
It has five pulses, in these pulses, first pulse is ASK others are FSK modulation.



FSK

One pulse	Interval (> 100 msec.)
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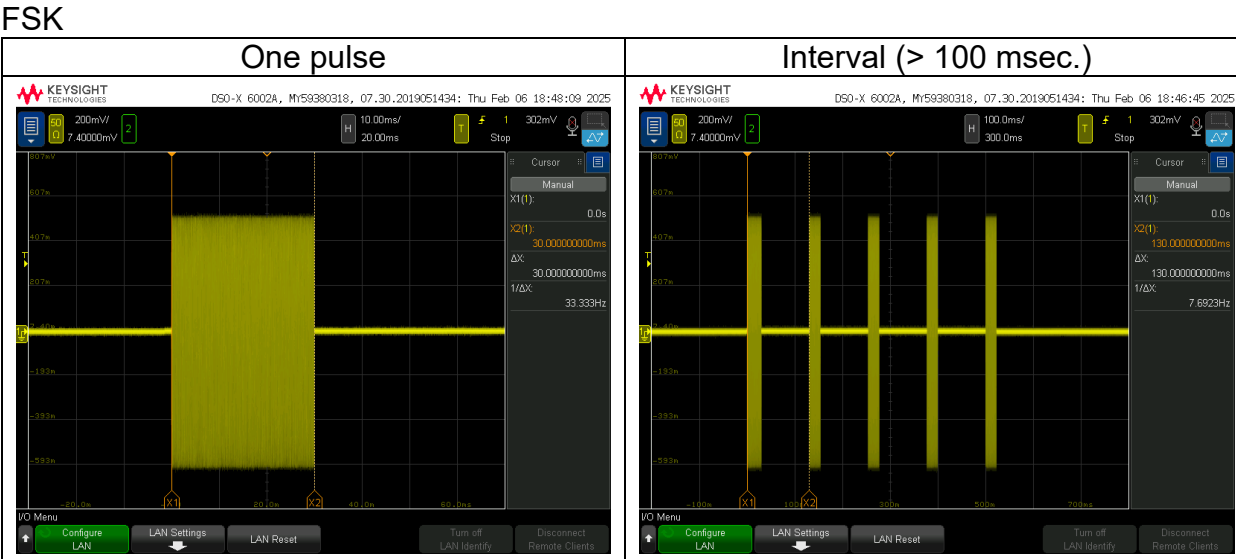
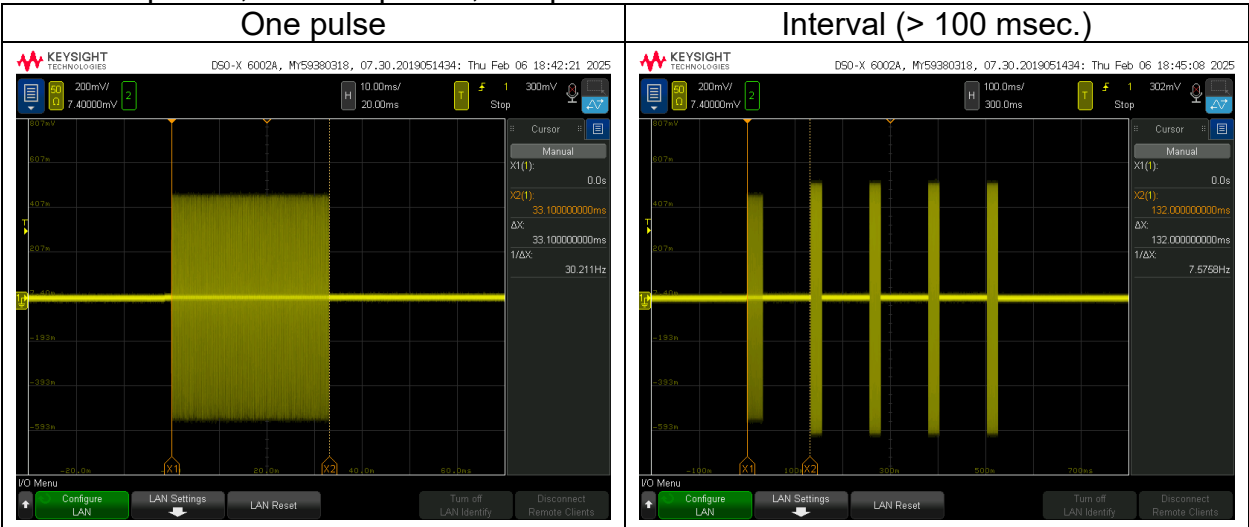


* "Timing of transmission" of the application documents was referred, since Intentional off time was unrealizable in measurement circumstance.

Duty Cycle

Test place	Ise EMC Lab.
Measurement room	No.8
Date	February 6, 2025
Temperature / Humidity	20 deg. C / 40 % RH
Engineer	Tetsuro Yoshida
Mode	Mode 5 and 7 / 433.92 MHz

ASK
It has five pulses, in these pulses, first pulse is ASK others are FSK modulation.



* "Timing of transmission" of the application documents was referred, since Intentional off time was unrealizable in measurement circumstance.

-20 dB Bandwidth / 99% emission bandwidth

Test place Ise EMC Lab.
Semi Anechoic Chamber No.8
Date February 6, 2025
Temperature / Humidity 20 deg. C / 40 % RH
Engineer Tetsuro Yoshida
Mode Mode 8

315 MHz: ASK

Bandwidth Limit : Fundamental Frequency 315.00 MHz x 0.25 % = 787.500 kHz

-20 dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
65.2890	787.500	Pass

99% emission bandwidth [kHz]	Bandwidth Limit [kHz]	Result
97.1682	787.500	Pass

315 MHz: FSK, Deviation 20 kHz

Bandwidth Limit : Fundamental Frequency 315.00 MHz x 0.25 % = 787.500 kHz

-20 dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
73.1860	787.500	Pass

99% emission bandwidth [kHz]	Bandwidth Limit [kHz]	Result
74.6599	787.500	Pass

315 MHz: FSK, Deviation 50 kHz

Bandwidth Limit : Fundamental Frequency 315.00 MHz x 0.25 % = 787.500 kHz

-20 dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
144.1700	787.500	Pass

99% emission bandwidth [kHz]	Bandwidth Limit [kHz]	Result
136.9795	787.500	Pass

-20 dB Bandwidth / 99% emission bandwidth

Test place Ise EMC Lab.
Semi Anechoic Chamber No.8
Date February 6, 2025
Temperature / Humidity 20 deg. C / 40 % RH
Engineer Tetsuro Yoshida
Mode Mode 8

433.92 MHz: ASK

Bandwidth Limit : Fundamental Frequency $433.92 \text{ MHz} \times 0.25 \% = 1084.800 \text{ kHz}$

-20 dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
82.9340	1084.800	Pass

99% emission bandwidth [kHz]	Bandwidth Limit [kHz]	Result
99.2169	1084.800	Pass

433.92 MHz: FSK, Deviation 20 kHz

Bandwidth Limit : Fundamental Frequency $433.92 \text{ MHz} \times 0.25 \% = 1084.800 \text{ kHz}$

-20 dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
74.8210	1084.800	Pass

99% emission bandwidth [kHz]	Bandwidth Limit [kHz]	Result
76.3825	1084.800	Pass

433.92 MHz: FSK, Deviation 50 kHz

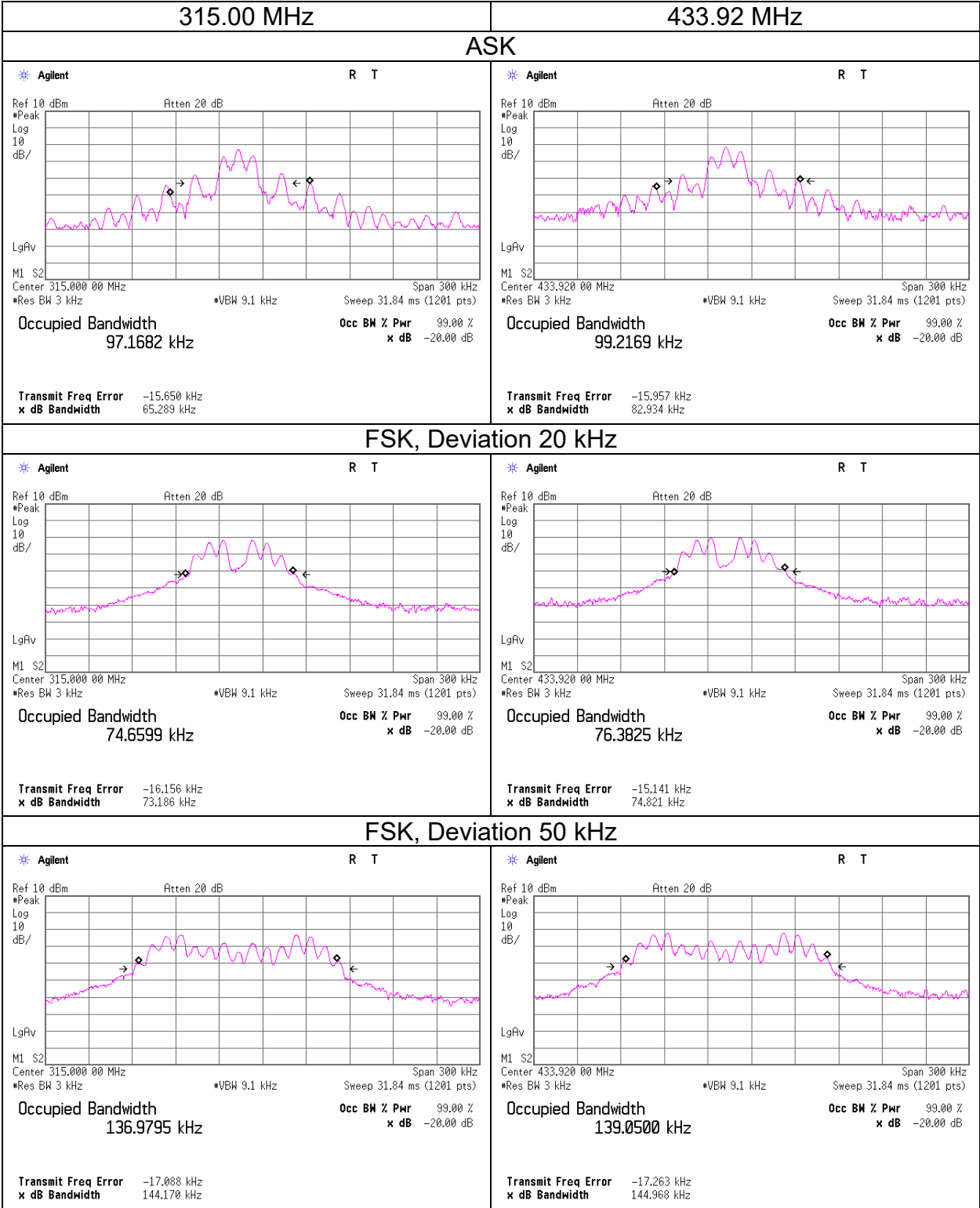
Bandwidth Limit : Fundamental Frequency $433.92 \text{ MHz} \times 0.25 \% = 1084.800 \text{ kHz}$

-20 dB Bandwidth [kHz]	Bandwidth Limit [kHz]	Result
144.9680	1084.800	Pass

99% emission bandwidth [kHz]	Bandwidth Limit [kHz]	Result
139.0500	1084.800	Pass

-20 dB Bandwidth / 99% emission bandwidth

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.8
Date	February 6, 2025
Temperature / Humidity	20 deg. C / 40 % RH
Engineer	Tetsuro Yoshida
Mode	Mode 8



APPENDIX 2: Test Instruments

Test Equipment

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-191	08/23/2024	12
RE	141323	Coaxial cable	UL-ISE	-	-	09/13/2024	12
RE	141425	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+BBA9106	VHA 91031302	08/23/2024	12
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	11/11/2024	12
RE	141532	DIGITAL HiTESTER	HIOKI E. E. CORPORATION	3805	051201197	01/16/2025	12
RE	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/24/2025	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/14/2025	12
RE	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	05/09/2024	12
RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	05/17/2024	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	12/11/2023	24
RE	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/12/2023	24
RE	142183	Measure	KOMELON	KMC-36	-	10/21/2024	12
RE	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	06/06/2024	12
RE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	242978	High Pass Filter 1-13 GHz	Pasternak	PE87FL1018	D.C. 2215	02/14/2025	12
RE	244709	Thermo-Hygrometer	HIOKI E. E. CORPORATION	LR5001	231202103	01/19/2025	12
RE	246001	Microwave Cable	Huber+Suhner	SF103/11PC35/11PC35/1000mm / SF126E/5000mm	800673(1m) / 610204(5m)	03/06/2024	12
RE	142645	Loop Antenna	UL Japan	-	-	-	-
AT	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/11/2024	12
AT	141279	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S303	03/03/2025	12
AT	141557	DIGITAL HiTESTER	HIOKI E. E. CORPORATION	3805	070900530	01/15/2025	12
AT	141810	Power Meter	Anritsu Corporation	ML2495A	824014	11/16/2024	12
AT	141832	Power sensor	Anritsu Corporation	MA2411B	738174	11/16/2024	12
AT	141855	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187750	11/14/2024	12
AT	211944	Digital Storage Oscilloscope	Keysight Technologies Inc	DSOX6002A	MY59380318	12/20/2024	12
AT	244711	Thermo-Hygrometer	HIOKI E. E. CORPORATION	LR5001	231202105	01/19/2025	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: Radiated Emission

AT: Antenna Terminal Conducted