RADIO TEST REPORT

Test Report No. 15610536H

Customer	**TOYOTA MOTOR CORPORATION**
Description of EUT	**Smart LF oscillator**
Model Number of EUT	**TMLF19D-8**
FCC ID	**NI4TMLF19D-8**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied**
Issue Date	**February 6, 2025**
Remarks	**-**

Representative test engineer	Approved by
	
Junya Okuno Engineer	Shinichi Miyazono Leader

CERTIFICATE 5107.02

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☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No. 15610536H

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15610536H	February 6, 2025	-

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	TOYOTA MOTOR CORPORATION
Address	1, Toyota-Cho, Toyota, Aichi, 471-8572, Japan
Telephone Number	+81-50-3166-4371
Contact Person	Arinobu Kimura

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	Smart LF oscillator
Model Number	TMLF19D-8
Serial Number	Refer to SECTION 4.2
Condition	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	December 24, 2024
Test Date	January 14 and 15, 2025

2.2 Product Description

General Specification

Rating	DC 12 V

Radio Specification

Equipment Type	Transmitter
Frequency of Operation	134.2 kHz
Type of Modulation	ASK
Antenna type	Outside Antenna (*1), Inside Antenna (*2), Rear Antenna (*3), Immobilizer Antenna *1: Maximum number of this antenna is 4. *2: Maximum number of this antenna is 3. *3: Maximum number of this antenna is 2.

Smart LF oscillator (model: TMLF19D-8) consists of the following parts:
- Smart ECU
- Outside Antenna
- Inside Antenna
- Rear Antenna
- Immobilizer Antenna

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 15.207 Conducted limits Section 15.209 Radiated emission limits; general requirements.

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)
Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 6.5, 6.12	<FCC> Section 15.209 <ISED> RSS-210 8.2 RSS-Gen 8.9	10.6 dB 134.2 kHz, 0 deg. Peak with Duty factor	Complied	Radiated
Electric Field Strength of Spurious Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 6.5, 6.6, 6.13	<FCC> Section 15.209 <ISED> RSS-210 8.3 RSS-Gen 8.9	20.8 dB 0.67100 MHz, 0 deg., QP	Complied	Radiated
-20 dB Bandwidth	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> -	<FCC> Reference data <ISED> -	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 is not the device that is designed to be connected to the public utility (AC) power line.					

FCC Part 15.31 (e)
The battery voltage (DC 12V) is provided to the EUT. Input voltage to RF part does not go through the regulator. So the test was performed with the supply voltage varied between 85 % and 115% of the nominal rated supply voltage (DC 12 V) and the variation of the input power does not affect the test result, 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 vehicle.
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	RSS-Gen 6.7	-	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

-20 dB Bandwidth and 99% Occupied Bandwidth

Item	Unit	Calculated Uncertainty (+/-)
Bandwidth (OBW)	%	0.96

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

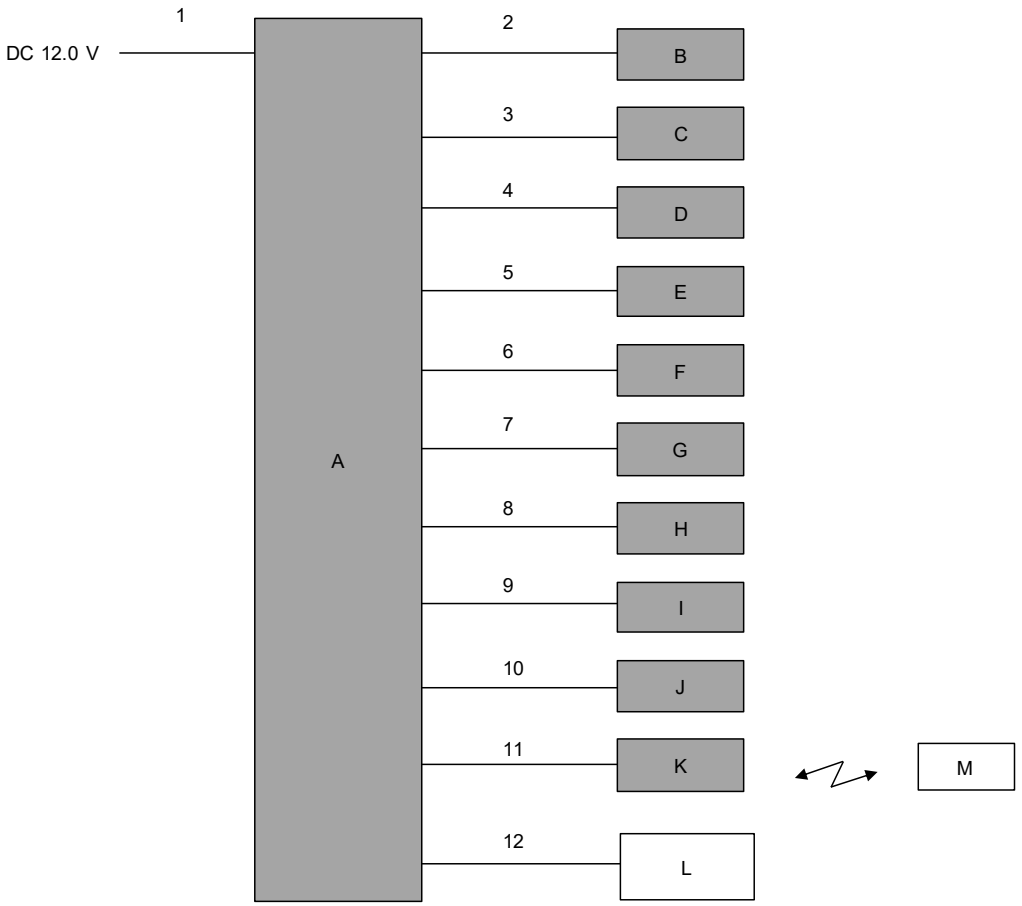
4.1. Operating Mode(s)

Test mode	Remarks
1) Tx 134.2 kHz, Outside Antenna	*1)
2) Tx 134.2 kHz, Inside Antenna	*1)
3) Tx 134.2 kHz, Rear Antenna	*1)
4) Tx 134.2 kHz, Immobilizer Antenna	*1), *2)
5) Tx 134.2 kHz, Outside Antenna and Rear Antenna (B, C, D, E, F and G)	*1)
*Power of the EUT was set by the software as follows; Software: 19CY_IDT_denpa_v01_200721 Version: 01 (Date: 2020.07.21, 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) Refer to Timing of transmission in "Operational Descrip-Transmission spec." for details.

*2) This EUT has two modes which transponder key is attached or not. The worst case was confirmed with and without transponder key attached, as a result, the test without transponder key attached was the worst case. Therefore the test without transponder key attached was performed only.

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 and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remark
A	Smart ECU	TMLF19D-8	LF19-168 *1) LF19-170 *2)	-	EUT
B	Outside Antenna	D15B2	TD1043	-	EUT
C	Outside Antenna	D15B2	TD1044	-	EUT
D	Outside Antenna	D15B2	TD1045	-	EUT
E	Outside Antenna	D15B2	TD1046	-	EUT
F	Rear Antenna	12TA0	TT275	-	EUT
G	Rear Antenna	12TA0	TT276	-	EUT
H	Inside Antenna	18WA0	TR439	-	EUT
I	Inside Antenna	18WA0	TR440	-	EUT
J	Inside Antenna	18WA0	TR441	-	EUT
K	Immobilizer Antenna	P15A1	TP252	-	EUT
L	Switch Box	-	-	-	-
M	Smart key	19CY	187	-	*3)

*1) Used foe Mode 1 to 4
*2) Used for Mode 5
*3) Used for Mode 4 only

List of Cables Used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.4	Unshielded	Unshielded	-
2	Signal Cable	3.0	Unshielded	Unshielded	-
3	Signal Cable	3.0	Unshielded	Unshielded	-
4	Signal Cable	3.0	Unshielded	Unshielded	-
5	Signal Cable	3.0	Unshielded	Unshielded	-
6	Signal Cable	3.0	Unshielded	Unshielded	-
7	Signal Cable	3.0	Unshielded	Unshielded	-
8	Signal Cable	3.0	Unshielded	Unshielded	-
9	Signal Cable	3.0	Unshielded	Unshielded	-
10	Signal Cable	3.0	Unshielded	Unshielded	-
11	Signal Cable	3.0	Unshielded	Unshielded	-
12	DC & Signal Cable	3.0	Unshielded	Unshielded	-

SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

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.

[Limit conversion]
The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 - 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

[Frequency: From 9 kHz to 30 MHz]
The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., and 135 deg., 180 deg.) and horizontal polarization.
*Refer to Figure 2 about Direction of the Loop Antenna.

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

These tests were performed in semi anechoic chamber. Therefore, the measured level of emissions may be higher than if measurements were made without a ground plane. However, test results were confirmed to pass against standard limit.

[Frequency: From 30 MHz to 1 GHz]
The measuring antenna height varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization.

[Test instruments and test settings]

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

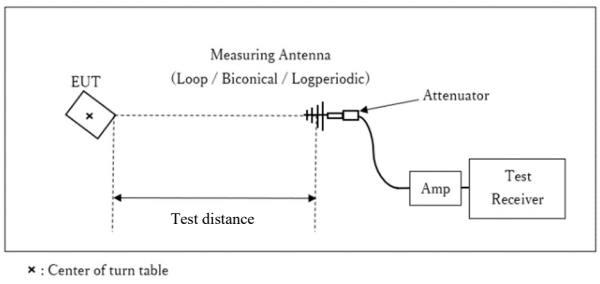
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

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
Instrument used	Test Receiver				
Detector	PK / AV	QP	PK / AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz
Test Distance	3 m *1)	3 m *1)	3 m *1)	3 m *2)	3 m

*1) Distance Factor: 40 x log (3 m / 300 m) = -80 dB
*2) Distance Factor: 40 x log (3 m / 30 m) = -40 dB

Figure 1: Test Setup

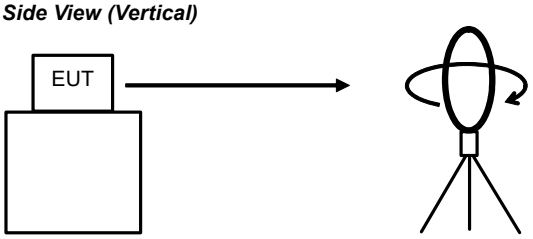
Below 1 GHz



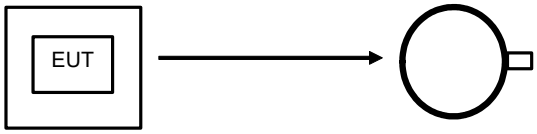
Test Distance: 3 m

Figure 2: Direction of the Loop Antenna

Side View (Vertical)

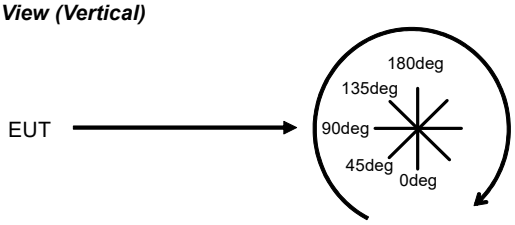


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

- 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 1 GHz
Test data : APPENDIX
Test result : Pass

SECTION 6: -20 dB Bandwidth

Test Procedure

The test was measured with a spectrum analyzer.

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

Test data : APPENDIX
Test result : Pass

SECTION 7: 99 % emission bandwidth

Test Procedure

The test was measured with a spectrum analyzer.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
99 % emission bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Peak hold was applied as Worst-case measurement.							

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Radiated Emission (Fundamental and Spurious Emission)

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 14, 2025	January 15, 2025
Temperature / Humidity	21 deg. C / 42 % RH	20 deg. C / 40 % RH
Engineer	Junya Okuno	Junya Okuno
	(Below 30 MHz)	(Above 30 MHz)
Mode	Mode 1	

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	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
0deg	0.13420	PK	101.0	19.2	-74.1	32.3	-	13.8	45.0	31.2	Fundamental (DC 10.2 V)
0deg	0.13420	PK	101.0	19.2	-74.1	32.3	-	13.8	45.0	31.2	Fundamental (DC 12.0 V)
0deg	0.13420	PK	101.0	19.2	-74.1	32.3	-	13.8	45.0	31.2	Fundamental (DC 13.8 V)
0deg	0.26840	PK	40.7	19.5	-64.3	32.3	-	-36.4	39.0	75.4	
0deg	0.40260	PK	50.8	19.5	-64.4	32.3	-	-26.4	35.5	61.9	
0deg	0.53680	QP	24.5	19.5	-24.4	32.3	-	-12.7	33.0	45.7	
0deg	0.67100	QP	38.3	19.5	-24.4	32.3	-	1.1	31.1	30.0	
0deg	0.80520	QP	21.9	19.5	-24.4	32.3	-	-15.3	29.5	44.8	
0deg	0.93940	QP	35.6	19.5	-24.3	32.3	-	-1.5	28.1	29.6	
0deg	1.07360	QP	21.2	19.5	-24.3	32.3	-	-15.9	26.9	42.8	Floor Noise
0deg	1.20780	QP	31.5	19.6	-24.3	32.3	-	-5.5	25.9	31.4	
0deg	1.34200	QP	20.9	19.6	-24.3	32.3	-	-16.1	25.0	41.1	Floor Noise
Hori.	35.862	QP	24.3	16.4	7.1	32.2	-	15.6	40.0	24.4	
Hori.	90.352	QP	28.2	8.5	7.8	32.2	-	12.3	43.5	31.2	
Hori.	160.000	QP	23.0	15.4	8.5	32.1	-	14.8	43.5	28.7	
Hori.	270.513	QP	21.6	12.9	9.5	32.0	-	12.0	46.0	34.0	Floor Noise
Hori.	420.132	QP	21.1	16.0	10.5	32.0	-	15.6	46.0	30.4	Floor Noise
Hori.	604.912	QP	21.0	19.2	11.6	32.1	-	19.7	46.0	26.3	Floor Noise
Vert.	35.862	QP	26.3	16.4	7.1	32.2	-	17.6	40.0	22.4	
Vert.	90.352	QP	30.5	8.5	7.8	32.2	-	14.6	43.5	28.9	
Vert.	160.000	QP	25.5	15.4	8.5	32.1	-	17.3	43.5	26.2	
Vert.	270.513	QP	21.6	12.9	9.5	32.0	-	12.0	46.0	34.0	Floor Noise
Vert.	420.132	QP	21.1	16.0	10.5	32.0	-	15.6	46.0	30.4	Floor Noise
Vert.	604.912	QP	21.0	19.2	11.6	32.1	-	19.7	46.0	26.3	Floor Noise

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg] or Polarity [Hori/Vert]	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
0deg	0.13420	PK	101.0	19.2	-74.1	32.3	0.0	13.8	25.0	***11.2***	Fundamental (DC 10.2 V)
0deg	0.13420	PK	101.0	19.2	-74.1	32.3	0.0	13.8	25.0	***11.2***	Fundamental (DC 12.0 V)
0deg	0.13420	PK	101.0	19.2	-74.1	32.3	0.0	13.8	25.0	***11.2***	Fundamental (DC 13.8 V)
0deg	0.26840	PK	40.7	19.5	-64.3	32.3	0.0	-36.4	19.0	55.4	
0deg	0.40260	PK	50.8	19.5	-64.4	32.3	0.0	-26.4	15.5	41.9	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier) + Duty factor *
* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3 m without Distance factor

Ant Deg [deg]	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
0deg	0.13420	PK	101.0	19.2	5.9	32.3	-	93.8	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amprifier)

If Gain 0.0dB shown in the above table, pre-amplifier was not used to avoid the influence of carrier power. The pre-amplifier used for carrier frequency measurement was not saturated.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*It was confirmed that there were no differences in the spurious emission due to the input voltage.

Radiated Emission (Fundamental and Spurious Emission)

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 14, 2025	January 15, 2025
Temperature / Humidity	21 deg. C / 42 % RH	20 deg. C / 40 % RH
Engineer	Junya Okuno	Junya Okuno
	(Below 30 MHz)	(Above 30 MHz)
Mode	Mode 2	

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	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
0deg	0.13420	PK	101.6	19.2	-74.1	32.3	-	14.4	45.0	30.6	Fundamental (DC 10.2 V)
0deg	0.13420	PK	101.6	19.2	-74.1	32.3	-	14.4	45.0	30.6	Fundamental (DC 12.0 V)
0deg	0.13420	PK	101.6	19.2	-74.1	32.3	-	14.4	45.0	30.6	Fundamental (DC 13.8 V)
0deg	0.26840	PK	38.3	19.5	-64.3	32.3	-	-38.8	39.0	77.8	
0deg	0.40260	PK	57.1	19.5	-64.4	32.3	-	-20.1	35.5	55.6	
0deg	0.53680	QP	36.5	19.5	-24.4	32.3	-	-0.7	33.0	33.7	
0deg	0.67100	QP	47.5	19.5	-24.4	32.3	-	10.3	31.1	20.8	
0deg	0.80520	QP	21.8	19.5	-24.4	32.3	-	-15.4	29.5	44.9	
0deg	0.93940	QP	39.9	19.5	-24.3	32.3	-	2.8	28.1	25.3	
0deg	1.07360	QP	21.1	19.5	-24.3	32.3	-	-16.0	26.9	42.9	Floor Noise
0deg	1.20780	QP	32.1	19.6	-24.3	32.3	-	-4.9	25.9	30.8	
0deg	1.34200	QP	20.9	19.6	-24.3	32.3	-	-16.1	25.0	41.1	Floor Noise
Hori.	35.668	QP	24.2	16.4	7.0	32.2	-	15.4	40.0	24.6	
Hori.	52.732	QP	29.9	10.3	7.3	32.2	-	15.3	40.0	24.7	
Hori.	160.000	QP	23.4	15.4	8.5	32.1	-	15.2	43.5	28.3	
Hori.	272.743	QP	21.4	13.1	9.5	32.0	-	12.0	46.0	34.0	Floor Noise
Hori.	417.774	QP	21.0	16.0	10.5	32.0	-	15.5	46.0	30.5	Floor Noise
Hori.	602.543	QP	20.9	19.2	11.5	32.1	-	19.5	46.0	26.5	Floor Noise
Vert.	35.668	QP	26.5	16.4	7.0	32.2	-	17.7	40.0	22.3	
Vert.	52.732	QP	30.8	10.3	7.3	32.2	-	16.2	40.0	23.8	
Vert.	160.000	QP	26.6	15.4	8.5	32.1	-	18.4	43.5	25.1	
Vert.	272.743	QP	21.4	13.1	9.5	32.0	-	12.0	46.0	34.0	Floor Noise
Vert.	417.774	QP	21.0	16.0	10.5	32.0	-	15.5	46.0	30.5	Floor Noise
Vert.	602.543	QP	20.9	19.2	11.5	32.1	-	19.5	46.0	26.5	Floor Noise

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg] or Polarity [Hori/Vert]	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
0deg	0.13420	PK	101.6	19.2	-74.1	32.3	0.0	14.4	25.0	***10.6***	Fundamental (DC 10.2 V)
0deg	0.13420	PK	101.6	19.2	-74.1	32.3	0.0	14.4	25.0	***10.6***	Fundamental (DC 12.0 V)
0deg	0.13420	PK	101.6	19.2	-74.1	32.3	0.0	14.4	25.0	***10.6***	Fundamental (DC 13.8 V)
0deg	0.26840	PK	38.3	19.5	-64.3	32.3	0.0	-38.8	19.0	57.8	
0deg	0.40260	PK	57.1	19.5	-64.4	32.3	0.0	-20.1	15.5	35.6	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier) + Duty factor *
* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3 m without Distance factor

Ant Deg [deg]	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
0deg	0.13420	PK	101.6	19.2	5.9	32.3	-	94.4	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amprifier)

If Gain 0.0dB shown in the above table, pre-amplifier was not used to avoid the influence of carrier power. The pre-amplifier used for carrier frequency measurement was not saturated.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*It was confirmed that there were no differences in the spurious emission due to the input voltage.

Radiated Emission (Fundamental and Spurious Emission)

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 14, 2025	January 15, 2025
Temperature / Humidity	21 deg. C / 42 % RH	20 deg. C / 40 % RH
Engineer	Junya Okuno	Junya Okuno
	(Below 30 MHz)	(Above 30 MHz)
Mode	Mode 3	

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	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
0deg	0.13420	PK	101.3	19.2	-74.1	32.3	-	14.1	45.0	30.9	Fundamental (DC 10.2 V)
0deg	0.13420	PK	101.3	19.2	-74.1	32.3	-	14.1	45.0	30.9	Fundamental (DC 12.0 V)
0deg	0.13420	PK	101.3	19.2	-74.1	32.3	-	14.1	45.0	30.9	Fundamental (DC 13.8 V)
0deg	0.26840	PK	39.6	19.5	-64.3	32.3	-	-37.5	39.0	76.5	
0deg	0.40260	PK	50.7	19.5	-64.4	32.3	-	-26.5	35.5	62.0	
0deg	0.53680	QP	42.7	19.5	-24.4	32.3	-	5.5	33.0	27.5	
0deg	0.67100	QP	37.6	19.5	-24.4	32.3	-	0.4	31.1	30.7	
0deg	0.80520	QP	21.8	19.5	-24.4	32.3	-	-15.4	29.5	44.9	
0deg	0.93940	QP	37.0	19.5	-24.3	32.3	-	-0.1	28.1	28.2	
0deg	1.07360	QP	21.1	19.5	-24.3	32.3	-	-16.0	26.9	42.9	Floor Noise
0deg	1.20780	QP	33.6	19.6	-24.3	32.3	-	-3.4	25.9	29.3	
0deg	1.34200	QP	20.8	19.6	-24.3	32.3	-	-16.2	25.0	41.2	Floor Noise
Hori.	35.677	QP	24.0	16.4	7.0	32.2	-	15.2	40.0	24.8	
Hori.	79.750	QP	26.7	6.8	7.7	32.2	-	9.0	40.0	31.0	
Hori.	160.000	QP	23.2	15.4	8.5	32.1	-	15.0	43.5	28.5	
Hori.	271.375	QP	21.4	13.0	9.5	32.0	-	11.9	46.0	34.1	Floor Noise
Hori.	419.883	QP	21.2	16.0	10.5	32.0	-	15.7	46.0	30.3	Floor Noise
Hori.	604.057	QP	21.0	19.2	11.5	32.1	-	19.6	46.0	26.4	Floor Noise
Vert.	35.677	QP	27.2	16.4	7.0	32.2	-	18.4	40.0	21.6	
Vert.	79.750	QP	33.5	6.8	7.7	32.2	-	15.8	40.0	24.2	
Vert.	160.000	QP	26.4	15.4	8.5	32.1	-	18.2	43.5	25.3	
Vert.	271.375	QP	21.4	13.0	9.5	32.0	-	11.9	46.0	34.1	Floor Noise
Vert.	419.883	QP	21.2	16.0	10.5	32.0	-	15.7	46.0	30.3	Floor Noise
Vert.	604.057	QP	21.0	19.2	11.5	32.1	-	19.6	46.0	26.4	Floor Noise

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg] or Polarity [Hori/Vert]	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
0deg	0.13420	PK	101.3	19.2	-74.1	32.3	0.0	14.1	25.0	***10.9***	Fundamental (DC 10.2 V)
0deg	0.13420	PK	101.3	19.2	-74.1	32.3	0.0	14.1	25.0	***10.9***	Fundamental (DC 12.0 V)
0deg	0.13420	PK	101.3	19.2	-74.1	32.3	0.0	14.1	25.0	***10.9***	Fundamental (DC 13.8 V)
0deg	0.26840	PK	39.6	19.5	-64.3	32.3	0.0	-37.5	19.0	56.5	
0deg	0.40260	PK	50.7	19.5	-64.4	32.3	0.0	-26.5	15.5	42.0	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier) + Duty factor *
* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3 m without Distance factor

Ant Deg [deg]	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
0deg	0.13420	PK	101.3	19.2	5.9	32.3	-	94.1	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amprifier)

If Gain 0.0dB shown in the above table, pre-amplifier was not used to avoid the influence of carrier power. The pre-amplifier used for carrier frequency measurement was not saturated.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*It was confirmed that there were no differences in the spurious emission due to the input voltage.

Radiated Emission (Fundamental and Spurious Emission)

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 14, 2025	January 15, 2025
Temperature / Humidity	21 deg. C / 42 % RH	20 deg. C / 40 % RH
Engineer	Junya Okuno	Junya Okuno
	(Below 30 MHz)	(Above 30 MHz)
Mode	Mode 4	

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	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
0deg	0.13420	PK	94.3	19.2	-74.1	32.3	-	7.1	45.0	37.9	Fundamental (DC 10.2 V)
0deg	0.13420	PK	94.3	19.2	-74.1	32.3	-	7.1	45.0	37.9	Fundamental (DC 12.0 V)
0deg	0.13420	PK	94.3	19.2	-74.1	32.3	-	7.1	45.0	37.9	Fundamental (DC 13.8 V)
0deg	0.26840	PK	40.2	19.5	-64.3	32.3	-	-36.9	39.0	75.9	
0deg	0.40260	PK	49.7	19.5	-64.4	32.3	-	-27.5	35.5	63.0	
0deg	0.53680	QP	23.0	19.5	-24.4	32.3	-	-14.2	33.0	47.2	
0deg	0.67100	QP	38.4	19.5	-24.4	32.3	-	1.2	31.1	29.9	
0deg	0.80520	QP	21.8	19.5	-24.4	32.3	-	-15.4	29.5	44.9	
0deg	0.93940	QP	31.4	19.5	-24.3	32.3	-	-5.7	28.1	33.8	
0deg	1.07360	QP	21.2	19.5	-24.3	32.3	-	-15.9	26.9	42.8	Floor Noise
0deg	1.20780	QP	26.3	19.6	-24.3	32.3	-	-10.7	25.9	36.6	
0deg	1.34200	QP	21.0	19.6	-24.3	32.3	-	-16.0	25.0	41.0	Floor Noise
Hori.	33.893	QP	23.5	17.1	7.0	32.2	-	15.4	40.0	24.6	
Hori.	77.295	QP	25.1	6.6	7.7	32.2	-	7.2	40.0	32.8	
Hori.	160.000	QP	24.0	15.4	8.5	32.1	-	15.8	43.5	27.7	
Hori.	273.425	QP	21.3	13.1	9.5	32.0	-	11.9	46.0	34.1	Floor Noise
Hori.	418.823	QP	21.2	16.0	10.5	32.0	-	15.7	46.0	30.3	Floor Noise
Hori.	602.543	QP	20.9	19.2	11.5	32.1	-	19.5	46.0	26.5	Floor Noise
Vert.	33.893	QP	27.1	17.1	7.0	32.2	-	19.0	40.0	21.0	
Vert.	77.295	QP	29.7	6.6	7.7	32.2	-	11.8	40.0	28.2	
Vert.	160.000	QP	27.0	15.4	8.5	32.1	-	18.8	43.5	24.7	
Vert.	273.425	QP	21.3	13.1	9.5	32.0	-	11.9	46.0	34.1	Floor Noise
Vert.	418.823	QP	21.2	16.0	10.5	32.0	-	15.7	46.0	30.3	Floor Noise
Vert.	602.543	QP	20.9	19.2	11.5	32.1	-	19.5	46.0	26.5	Floor Noise

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg] or Polarity [Hori/Vert]	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
0deg	0.13420	PK	94.3	19.2	-74.1	32.3	0.0	7.1	25.0	***17.9***	Fundamental (DC 10.2 V)
0deg	0.13420	PK	94.3	19.2	-74.1	32.3	0.0	7.1	25.0	***17.9***	Fundamental (DC 12.0 V)
0deg	0.13420	PK	94.3	19.2	-74.1	32.3	0.0	7.1	25.0	***17.9***	Fundamental (DC 13.8 V)
0deg	0.26840	PK	40.2	19.5	-64.3	32.3	0.0	-36.9	19.0	55.9	
0deg	0.40260	PK	49.7	19.5	-64.4	32.3	0.0	-27.5	15.5	43.0	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier) + Duty factor *
* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3 m without Distance factor

Ant Deg [deg]	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
0deg	0.13420	PK	94.3	19.2	5.9	32.3	-	87.1	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amprifier)

If Gain 0.0dB shown in the above table, pre-amplifier was not used to avoid the influence of carrier power. The pre-amplifier used for carrier frequency measurement was not saturated.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*It was confirmed that there were no differences in the spurious emission due to the input voltage.

Radiated Emission (Fundamental and Spurious Emission)

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 14, 2025	January 15, 2025
Temperature / Humidity	21 deg. C / 42 % RH	20 deg. C / 40 % RH
Engineer	Junya Okuno	Junya Okuno
	(Below 30 MHz)	(Above 30 MHz)
Mode	Mode 5	

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	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
0deg	0.13420	PK	96.2	19.2	-74.1	32.3	-	9.0	45.0	36.0	Fundamental (DC 10.2 V)
0deg	0.13420	PK	96.2	19.2	-74.1	32.3	-	9.0	45.0	36.0	Fundamental (DC 12.0 V)
0deg	0.13420	PK	96.2	19.2	-74.1	32.3	-	9.0	45.0	36.0	Fundamental (DC 13.8 V)
0deg	0.26840	PK	51.2	19.5	-64.3	32.3	-	-25.9	39.0	64.9	
0deg	0.40260	PK	56.1	19.5	-64.4	32.3	-	-21.1	35.5	56.6	
0deg	0.53680	QP	31.0	19.5	-24.4	32.3	-	-6.2	33.0	39.2	
0deg	0.67100	QP	40.2	19.5	-24.4	32.3	-	3.0	31.1	28.1	
0deg	0.80520	QP	22.9	19.5	-24.4	32.3	-	-14.3	29.5	43.8	
0deg	0.93940	QP	36.0	19.5	-24.3	32.3	-	-1.1	28.1	29.2	
0deg	1.07360	QP	22.0	19.5	-24.3	32.3	-	-15.1	26.9	42.0	
0deg	1.20780	QP	31.1	19.6	-24.3	32.3	-	-5.9	25.9	31.8	
0deg	1.34200	QP	21.1	19.6	-24.3	32.3	-	-15.9	25.0	40.9	Floor Noise
Hori.	35.489	QP	23.2	16.5	7.0	32.2	-	14.5	40.0	25.5	
Hori.	52.512	QP	25.5	10.4	7.3	32.2	-	11.0	40.0	29.0	
Hori.	150.320	QP	22.9	14.9	8.4	32.1	-	14.1	43.5	29.4	
Hori.	272.057	QP	21.4	13.0	9.5	32.0	-	11.9	46.0	34.1	Floor Noise
Hori.	416.727	QP	21.1	16.0	10.5	32.0	-	15.6	46.0	30.4	Floor Noise
Hori.	604.055	QP	20.9	19.2	11.5	32.1	-	19.5	46.0	26.5	Floor Noise
Vert.	35.489	QP	26.0	16.5	7.0	32.2	-	17.3	40.0	***22.7***	
Vert.	52.512	QP	31.5	10.4	7.3	32.2	-	17.0	40.0	23.0	
Vert.	150.320	QP	24.0	14.9	8.4	32.1	-	15.2	43.5	28.3	
Vert.	272.057	QP	21.4	13.0	9.5	32.0	-	11.9	46.0	34.1	Floor Noise
Vert.	416.727	QP	21.1	16.0	10.5	32.0	-	15.6	46.0	30.4	Floor Noise
Vert.	604.055	QP	20.9	19.2	11.5	32.1	-	19.5	46.0	26.5	Floor Noise

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier)

PK with Duty factor

Ant Deg [deg] or Polarity [Hori/Vert]	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
0deg	0.13420	PK	96.2	19.2	-74.1	32.3	-22.1	-13.1	25.0	38.1	Fundamental (DC 10.2 V)
0deg	0.13420	PK	96.2	19.2	-74.1	32.3	-22.1	-13.1	25.0	38.1	Fundamental (DC 12.0 V)
0deg	0.13420	PK	96.2	19.2	-74.1	32.3	-22.1	-13.1	25.0	38.1	Fundamental (DC 13.8 V)
0deg	0.26840	PK	51.2	19.5	-64.3	32.3	-22.1	-48.0	19.0	67.0	
0deg	0.40260	PK	56.1	19.5	-64.4	32.3	-22.1	-43.2	15.5	58.7	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amprifier) + Duty factor *
* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3 m without Distance factor

Ant Deg [deg]	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
0deg	0.13420	PK	96.2	19.2	5.9	32.3	-	89.0	-	-	Fundamental

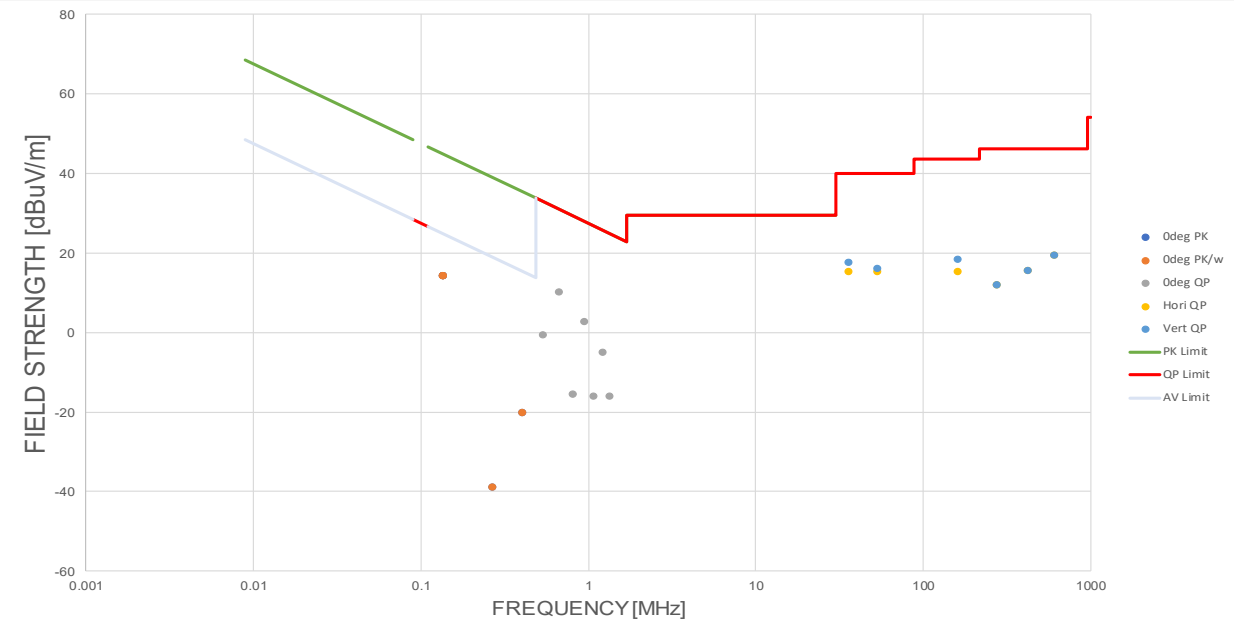
Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amprifier)

If Gain 0.0dB shown in the above table, pre-amplifier was not used to avoid the influence of carrier power. The pre-amplifier used for carrier frequency measurement was not saturated.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*It was confirmed that there were no differences in the spurious emission due to the input voltage.

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

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	January 14, 2025	January 15, 2025
Temperature / Humidity	21 deg. C / 42 % RH	20 deg. C / 40 % RH
Engineer	Junya Okuno	Junya Okuno
Mode	Mode 2	

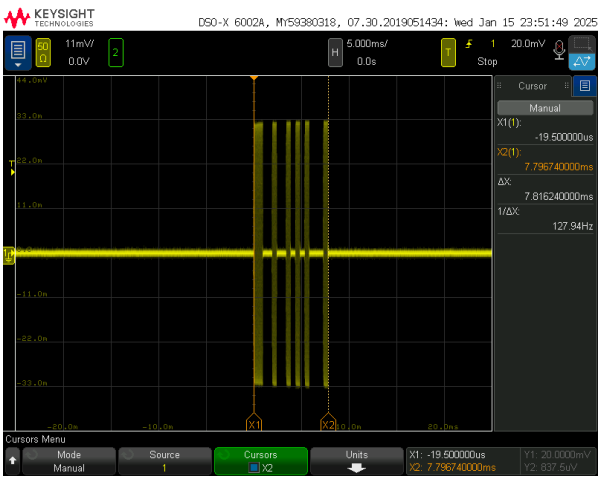


Duty Cycle

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	January 15, 2025
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Takafumi Noguchi
Mode	Mode 5

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty factor [dB]
7.82	100	0.0782	-22.1

Duty = 20 * $\log_{10}$(ON time/Cycle)

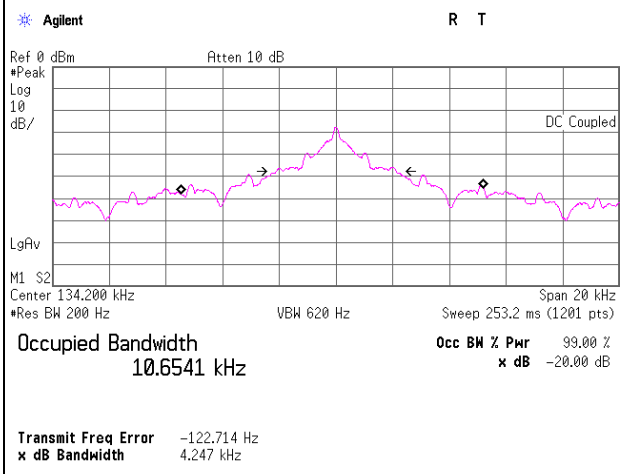
One transmission duration 7.82 msec	Transmission cycle > 100 msec
	

-20 dB Bandwidth / 99 % emission bandwidth

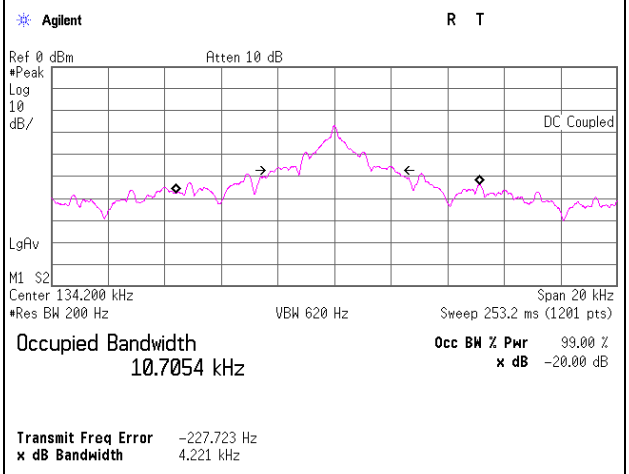
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	January 15, 2025
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Takafumi Noguchi

Mode	99 % emission bandwidth [kHz]	-20 dB Bandwidth [kHz]
1	10.6541	4.247
2	10.7054	4.221
3	10.6492	4.008
4 (without key)	12.2177	5.431
4 (with key)	14.7589	6.650
5	17.7923	10.477

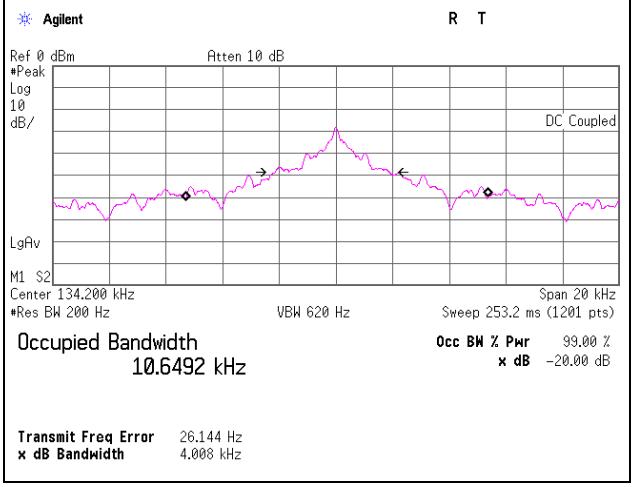
Mode 1



Mode 2



Mode 3

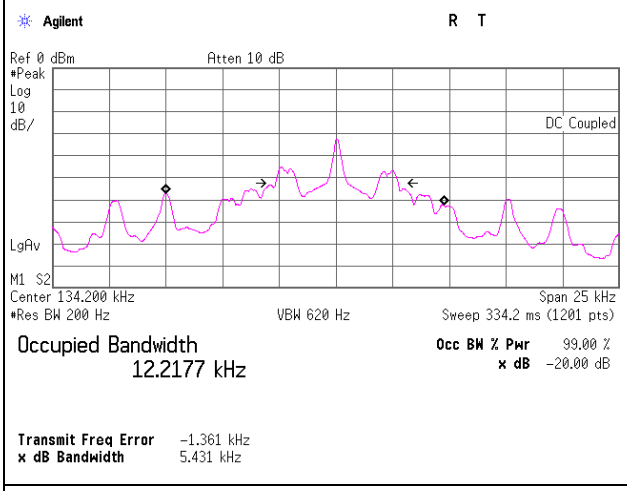


*It was confirmed that there were no differences in the bandwidth due to the input voltage.

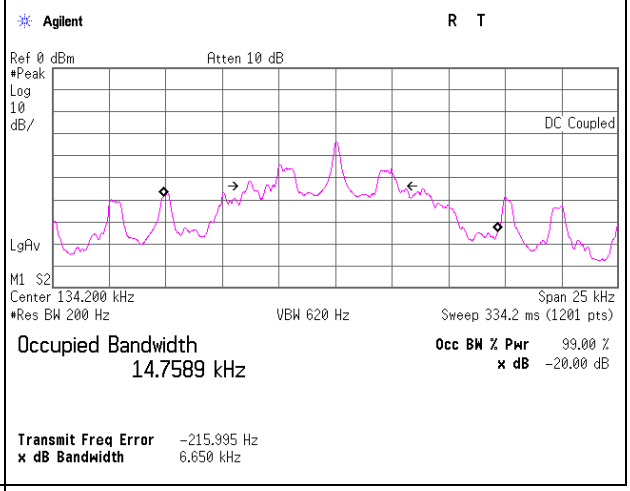
-20 dB Bandwidth / 99 % emission bandwidth

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	January 15, 2025
Temperature / Humidity	21 deg. C / 40 % RH
Engineer	Takafumi Noguchi

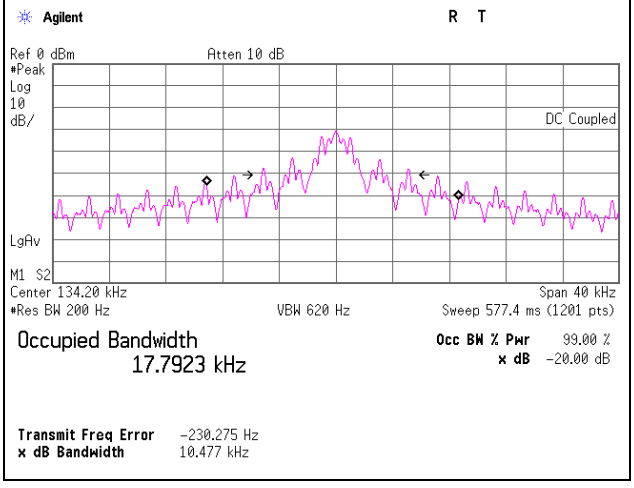
Mode 4 (without key)



Mode 4 (with key)



Mode 5



*It was confirmed that there were no differences in the bandwidth due to the input voltage.

APPENDIX 2: Test instruments

Test Equipment

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM14/ sucoform141-PE/ 421-010/ RFM-E321(SW)	-/00640	07/06/2024	12
RE	141217	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM141/ 421-010/ sucoform141-PE/ RFM-E121(SW)	-/04178	06/14/2024	12
RE	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-191	08/23/2024	12
RE	141295	High Pass Filter 0.15-30MHz	Rohde & Schwarz	EZ-25/3	100041	02/14/2024	12
RE	141323	Coaxial cable	UL-ISE	-	-	09/13/2024	12
RE	141424	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+BBA9106	1915	03/15/2024	12
RE	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	051201197	01/31/2024	12
RE	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	02/01/2024	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/17/2024	12
RE	141855	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187750	11/14/2024	12
RE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	06/05/2024	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	12/11/2023	24
RE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	12/13/2023	24
RE	142183	Measure	KOMELON	KMC-36	-	10/21/2024	12
RE	142230	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	06/06/2024	12
RE	146613	Loop Antenna	Rohde & Schwarz	HFH2-Z2	842906/011	09/02/2024	12
RE	159670	Coaxial Cable	UL-ISE	-	-	11/11/2024	12
RE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	211944	Digital Storage Oscilloscope	Keysight Technologies Inc	DSOX6002A	MY59380318	12/20/2024	12
RE	244709	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202103	01/25/2024	12
RE	244710	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202104	01/25/2024	12
RE	252515	Active Loop Antenna	Schwarzbeck Mess-Elektronik OHG	FMZB 1519-60 D	1519-60 D-079	09/26/2024	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