RADIO TEST REPORT

Test Report No. : 13705478H-A-R2

Applicant	:	**TOYOTA MOTOR CORPORATION**
Type of EUT	:	**Smart LF Oscillator**
Model Number of EUT	:	**TMLF19D-3**
FCC ID	:	**NI4TMLF19D-3**
Test regulation	:	**FCC Part 15 Subpart C: 2021**
Test Result	:	**Complied (Refer to SECTION 3)**

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3. This sample tested is in compliance with the limits of the above regulation.
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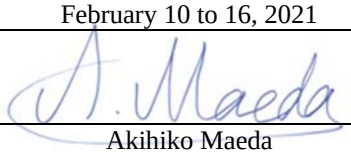
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan 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 13705478H-A-R1. 13705478H-A-R1 is replaced with this report.

Date of test: February 10 to 16, 2021

Representative test engineer:



Akihiko Maeda
Engineer
Consumer Technology Division

Approved by:

Motoya Imura
Leader
Consumer Technology Division

CERTIFICATE 5107.02

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

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REVISION HISTORY

Original Test Report No.: 13705478H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13705478H-A	March 17, 2021	-	-
1	13705478H-A-R1	April 15, 2021	P.28	Deletion of the following duplicate items from the Test equipment list; MAEC-03, MOS-13, MMM-08, MJM-16, MAT-95, MPA-13
1	13705478H-A-R1	April 15, 2021	P.15 to 21	Change the note below the data; from "If Gain 0.0 dB 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." to " As for Gain 0.0 dB shown in the above table, pre-amplifier was not used. "
2	13705478H-A-R2	April 27, 2021	P.21	Replacement of the data due to Duty factor change.
2	13705478H-A-R2	April 27, 2021	P.21	Deletion of the following sentence. * Since the peak emission result satisfied the average limit, duty factor was omitted.
2	13705478H-A-R2	April 27, 2021	P.23	Change the Duty Cycle data.
2	13705478H-A-R2	April 27, 2021	P.23	Change of the note sentence under the test data.
2	13705478H-A-R2	April 27, 2021	P.24	Deletion of the On Time Measurement 1/2 and 2/2 data.

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Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation
AC	Alternating Current
AFH	Adaptive Frequency Hopping
AM	Amplitude Modulation
Amp, AMP	Amplifier
ANSI	American National Standards Institute
Ant, ANT	Antenna
AP	Access Point
ASK	Amplitude Shift Keying
Atten., ATT	Attenuator
AV	Average
BPSK	Binary Phase-Shift Keying
BR	Bluetooth Basic Rate
BT	Bluetooth
BT LE	Bluetooth Low Energy
BW	BandWidth
Cal Int	Calibration Interval
CCK	Complementary Code Keying
Ch., CH	Channel
CISPR	Comite International Special des Perturbations Radioelectriques
CW	Continuous Wave
DBPSK	Differential BPSK
DC	Direct Current
D-factor	Distance factor
DFS	Dynamic Frequency Selection
DQPSK	Differential QPSK
DSSS	Direct Sequence Spread Spectrum
EDR	Enhanced Data Rate
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EN	European Norm
ERP, e.r.p.	Effective Radiated Power
EU	European Union
EUT	Equipment Under Test
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
MCS	Modulation and Coding Scheme
MRA	Mutual Recognition Arrangement
N/A	Not Applicable
NIST	National Institute of Standards and Technology
NS	No signal detect.
NSA	Normalized Site Attenuation
NVLAP	National Voluntary Laboratory Accreditation Program
OBW	Occupied Band Width
OFDM	Orthogonal Frequency Division Multiplexing
P/M	Power meter
PCB	Printed Circuit Board
PER	Packet Error Rate
PHY	Physical Layer
PK	Peak
PN	Pseudo random Noise
PRBS	Pseudo-Random Bit Sequence
PSD	Power Spectral Density
QAM	Quadrature Amplitude Modulation
QP	Quasi-Peak
QPSK	Quadri-Phase Shift Keying
RBW	Resolution Band Width
RDS	Radio Data System
RE	Radio Equipment
RF	Radio Frequency
RMS	Root Mean Square
RSS	Radio Standards Specifications
Rx	Receiving
SA, S/A	Spectrum Analyzer
SG	Signal Generator
SVSWR	Site-Voltage Standing Wave Ratio
TR	Test Receiver
Tx	Transmitting
VBW	Video BandWidth
Vert.	Vertical
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	:	+81-50-3166-3743
Facsimile Number	:	+81-566-94-1161
Contact Person	:	Shinji Suganuma

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)
- 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	:	Smart LF Oscillator
Model Number	:	TMLF19D-3
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 12.0 V
Receipt Date	:	February 5, 2021
Country of Mass-production	:	Japan
Condition	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2. Product Description

Smart LF Oscillator, model: TMLF19D-3 is a transmitter that is installed in a motor vehicle and is used as part of Smart System.

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	134.2 kHz
Modulation	:	ASK
Antenna type	:	Outside antenna (*1), Inside antenna (*2), Rear antenna (*3) *1: Maximum number of this antenna is 4. *2: Maximum number of this antenna is 5. *3: Maximum number of this antenna is 6.
Clock frequency (Maximum)	:	16.0000 MHz (Ceramic)

Smart LF Oscillator (model: TMLF19D-3) consists of the following parts:
- Smart ECU
- Immobilizer Antenna
- Inside Antenna
- Outside Antenna
- Rear Antenna

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on January 12, 2021 and effective February 11, 2021

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits; general requirements.

* The revision does not affect the test result conducted before its effective date.

3.2 Procedures and results

Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
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	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 4.4 RSS-Gen 8.9	Radiated	N/A	6.5 dB 0.13420 MHz, 0 deg. Peak with Duty factor, <Mode 4>	Complied a)
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 4.4 RSS-Gen 8.9	Radiated	N/A	15.7 dB 0.67100 MHz, 0 deg. QP, <Mode 7>	Complied a)
-26 dB Bandwidth	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> -	<FCC> Reference data <ISED> -	Radiated	N/A	N/A	Complied b)

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 is not the device that is designed to be connected to the public utility (AC) power line.

a) Refer to APPENDIX 1 (data of Radiated emission)
b) Refer to APPENDIX 1 (data of -26 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)
This EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage.
Instead of a new battery, DC power supply was used for the test.
That does not affect the test result, therefore the 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	Remarks	Deviation	Worst margin	Results
99 % Occupied Band Width	RSS-Gen 6.7	-	Radiated	N/A	N/A	-
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.						

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 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.

Ise EMC Lab.

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 (+/-)
-26 dB 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: 199967
ISED Lab Company Number: 2973C / CAB identifier: JP0002
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
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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.11 measurement room	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

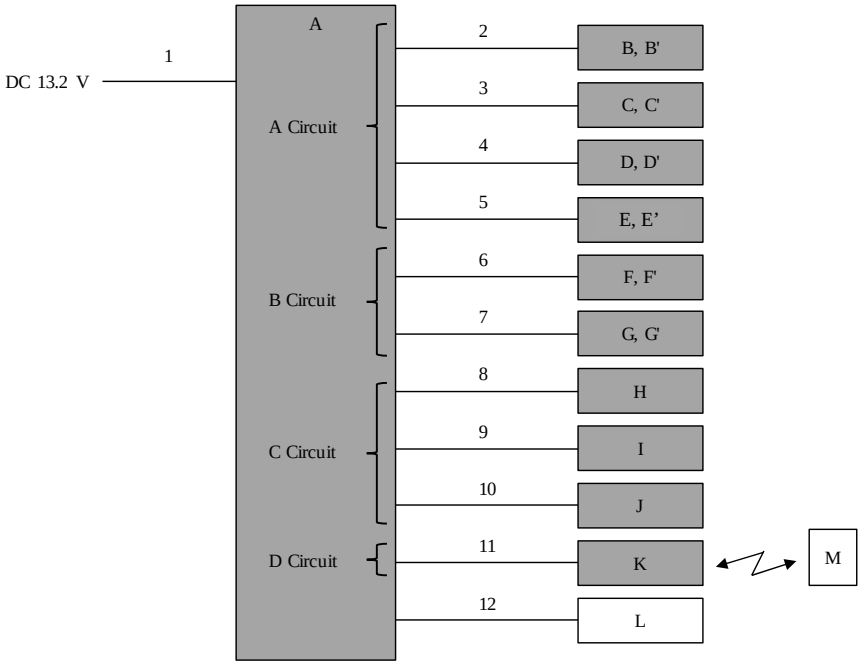
4.1. Operating Mode(s)

Test mode	Remarks*1)
1) Tx 134.2kHz, Outside Antenna in A circuit	Section 2 of Timing of transmission
2) Tx 134.2kHz, Rear Antenna in A circuit	Section 2 of Timing of transmission
3) Tx 134.2kHz, Rear Antenna in B circuit	Section 2 of Timing of transmission
4) Tx 134.2kHz, Inside Antenna in B circuit	Section 2 of Timing of transmission
5) Tx 134.2kHz, Inside Antenna in C circuit	Section 2 of Timing of transmission
6) Tx 134.2kHz, Immobilizer Antenna in D circuit	Section 3 of Timing of transmission
7) Tx 134.2kHz, Rear Antenna B'+C'+D'+E' and Inside Antenna F'+G')	Section 1 of Timing of transmission
* EUT was set by the software as follows; Software: 19CY_IDT_denpa_v01_200721 Version 01 (Date: 2020.7.21, 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 "Theory of Operation" for details.

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	Remarks
A	Smart ECU	TMLF19D-3	TE137(LF19-006) *1) TE139(LF19-012) *2)	-	EUT
B	Outside Antenna	19DA2	No.245	-	EUT
B'	Rear Antenna	12TA0	No.082	-	EUT
C	Outside Antenna	19DA2	No.246	-	EUT
C'	Rear Antenna	12TA0	No.083	-	EUT
D	Outside Antenna	19DA2	No.247	-	EUT
D'	Rear Antenna	12TA0	No.084	-	EUT
E	Outside Antenna	19DA2	No.248	-	EUT
E'	Rear Antenna	12TA0	No.085	-	EUT
F	Rear Antenna	12TA0	No.086	-	EUT
F'	Inside Antenna	18WA0	No.145	-	EUT
G	Rear Antenna	12TA0	No.087	-	EUT
G'	Inside Antenna	18WA0	No.146	-	EUT
H	Inside Antenna	18WA0	No.142	-	EUT
I	Inside Antenna	18WA0	No.143	-	EUT
J	Inside Antenna	18WA0	No.144	-	EUT
K	Immobilizer Antenna	18PA1	No.108	-	EUT
L	Switch Box	TB066	No.4	-	-
M	Smart Key	19CY-068	-	-	-

*1) Used for Mode 1, 2, 3, 4, 5, 6
*2) Used for Mode 7

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Antenna Cable	3.0	Unshielded	Unshielded	-
3	Antenna Cable	3.0	Unshielded	Unshielded	-
4	Antenna Cable	3.0	Unshielded	Unshielded	-
5	Antenna Cable	3.0	Unshielded	Unshielded	-
6	Antenna Cable	3.0	Unshielded	Unshielded	-
7	Antenna Cable	3.0	Unshielded	Unshielded	-
8	Antenna Cable	3.0	Unshielded	Unshielded	-
9	Antenna Cable	3.0	Unshielded	Unshielded	-
10	Antenna Cable	3.0	Unshielded	Unshielded	-
11	Antenna Cable	3.0	Unshielded	Unshielded	-
12	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.

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.) and horizontal polarization.
*Refer to Figure 1 about Direction of the Loop Antenna.

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.

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.

Test Antennas are used as below;

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

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

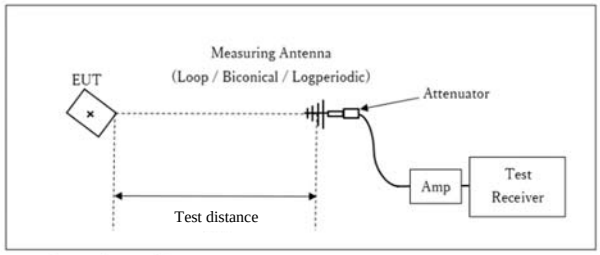
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open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

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.

[Test Setup]

Below 1 GHz



Test Distance: 3 m

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

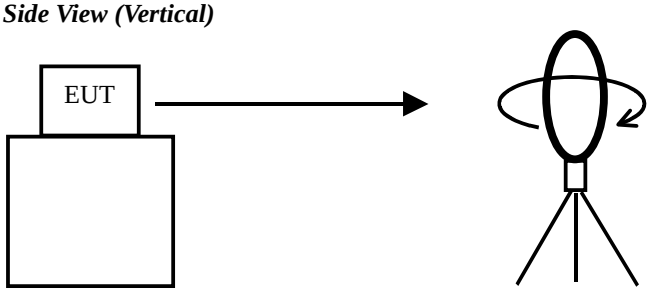
This EUT has two modes which transponder key is inserted or not. The worst case was confirmed with and without transponder key, as a result, the test without transponder key was the worst case. Therefore the test without transponder key was performed only.

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

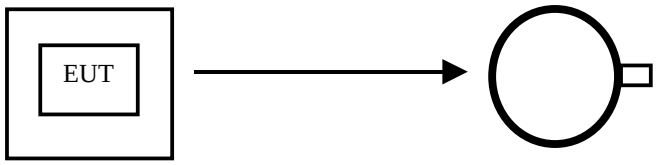
Measurement range : 9 kHz - 1 GHz
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

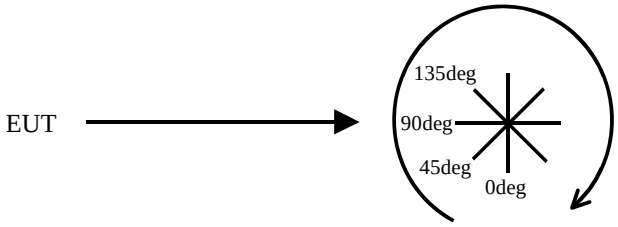


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

SECTION 6: -26 dB Bandwidth

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

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26 dB Bandwidth	510 Hz	1.6 kHz	50 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1
Test result : Pass

SECTION 7: 99% Bandwidth

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

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

Radiated Emission (Fundamental and Spurious Emission)

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 11, 2021
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Junki Nagatomi
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	71.0	18.9	-74.0	0.0	-	15.9	45.0	29.1	Fundamental
0deg	0.26840	PK	45.8	18.9	-64.2	32.3	-	-31.9	39.0	70.9	
0deg	0.40260	PK	56.2	18.8	-64.3	32.3	-	-21.6	35.5	57.1	
0deg	0.53680	QP	23.8	18.8	-24.3	32.3	-	-14.0	33.0	47.0	
0deg	0.67100	QP	45.1	18.8	-24.3	32.4	-	7.3	31.1	23.8	
0deg	0.80520	QP	22.5	18.8	-24.2	32.4	-	-15.4	29.5	44.8	
0deg	0.93940	QP	36.3	18.8	-24.2	32.4	-	-1.6	28.1	29.7	
0deg	1.07360	QP	21.8	18.8	-24.2	32.4	-	-16.1	26.9	43.0	
0deg	1.20780	QP	27.6	18.8	-24.2	32.4	-	-10.3	25.9	36.2	
0deg	1.34200	QP	21.3	18.8	-24.2	32.4	-	-16.5	25.0	41.5	
Hori.	30.210	QP	22.6	18.4	7.1	32.3	-	15.8	40.0	24.2	
Hori.	69.899	QP	22.4	6.4	7.8	32.3	-	4.3	40.0	35.7	
Hori.	160.209	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Hori.	300.020	QP	22.7	13.5	10.1	32.1	-	14.2	46.0	31.9	
Hori.	500.221	QP	21.9	17.7	11.4	32.1	-	18.9	46.0	27.1	
Hori.	799.893	QP	22.1	20.7	13.1	31.5	-	24.3	46.0	21.7	
Vert.	30.222	QP	23.2	18.4	7.1	32.3	-	16.4	40.0	23.6	
Vert.	70.042	QP	29.6	6.4	7.8	32.3	-	11.5	40.0	28.5	
Vert.	159.993	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Vert.	300.214	QP	22.6	13.5	10.1	32.1	-	14.1	46.0	32.0	
Vert.	499.678	QP	22.0	17.7	11.4	32.1	-	19.0	46.0	27.0	
Vert.	800.035	QP	22.1	20.7	13.1	31.5	-	24.3	46.0	21.7	

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	71.0	18.9	-74.0	0.0	0.0	15.9	25.0	9.0	Fundamental
0deg	0.26840	PK	45.8	18.9	-64.2	32.3	0.0	-31.9	19.0	50.9	
0deg	0.40260	PK	56.2	18.8	-64.3	32.3	0.0	-21.6	15.5	37.1	

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 3m 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	71.0	18.9	6.0	0.0	-	95.9	-	-	Fundamental

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

As for Gain 0.0 dB shown in the above table, pre-amplifier was not used.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Radiated Emission (Fundamental and Spurious Emission)

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 11, 2021
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Junki Nagatomi
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	71.6	18.9	-74.0	0.0	-	16.5	45.0	28.5	Fundamental
0deg	0.26840	PK	42.5	18.9	-64.2	32.3	-	-35.2	39.0	74.2	
0deg	0.40260	PK	53.4	18.8	-64.3	32.3	-	-24.4	35.5	59.9	
0deg	0.53680	QP	45.3	18.8	-24.3	32.3	-	7.5	33.0	25.5	
0deg	0.67100	QP	40.6	18.8	-24.3	32.4	-	2.8	31.1	28.3	
0deg	0.80520	QP	21.8	18.8	-24.2	32.4	-	-16.1	29.5	45.5	
0deg	0.93940	QP	39.3	18.8	-24.2	32.4	-	1.4	28.1	26.7	
0deg	1.07360	QP	21.4	18.8	-24.2	32.4	-	-16.5	26.9	43.4	
0deg	1.20780	QP	35.4	18.8	-24.2	32.4	-	-2.5	25.9	28.4	
0deg	1.34200	QP	21.2	18.8	-24.2	32.4	-	-16.6	25.0	41.6	
Hori.	30.022	QP	22.6	18.5	7.1	32.3	-	15.9	40.0	24.1	
Hori.	70.013	QP	22.4	6.4	7.8	32.3	-	4.3	40.0	35.7	
Hori.	159.891	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Hori.	299.980	QP	22.7	13.5	10.1	32.1	-	14.2	46.0	31.9	
Hori.	500.221	QP	21.9	17.7	11.4	32.1	-	18.9	46.0	27.1	
Hori.	800.234	QP	22.1	20.7	13.1	31.5	-	24.3	46.0	21.7	
Vert.	30.210	QP	23.2	18.4	7.1	32.3	-	16.4	40.0	23.6	
Vert.	68.726	QP	28.7	6.4	7.8	32.3	-	10.6	40.0	29.4	
Vert.	77.292	QP	26.5	6.7	7.9	32.3	-	8.8	40.0	31.2	
Vert.	300.143	QP	22.6	13.5	10.1	32.1	-	14.1	46.0	32.0	
Vert.	500.230	QP	22.0	17.7	11.4	32.1	-	19.0	46.0	27.0	
Vert.	800.221	QP	22.1	20.7	13.1	31.5	-	24.3	46.0	21.7	

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	71.6	18.9	-74.0	0.0	0.0	16.5	25.0	8.5	Fundamental
0deg	0.26840	PK	42.5	18.9	-64.2	32.3	0.0	-35.2	19.0	54.2	
0deg	0.40260	PK	53.4	18.8	-64.3	32.3	0.0	-24.4	15.5	39.9	

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 3m 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	71.6	18.9	6.0	0.0	-	96.5	-	-	Fundamental

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

As for Gain 0.0 dB shown in the above table, pre-amplifier was not used.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Radiated Emission (Fundamental and Spurious Emission)

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 11, 2021
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Junki Nagatomi
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	66.8	18.9	-74.0	0.0	-	11.7	45.0	33.3	Fundamental
0deg	0.26840	PK	40.0	18.9	-64.2	32.3	-	-37.7	39.0	76.7	
0deg	0.40260	PK	51.9	18.8	-64.3	32.3	-	-25.9	35.5	61.4	
0deg	0.53680	QP	43.8	18.8	-24.3	32.3	-	6.0	33.0	27.0	
0deg	0.67100	QP	39.4	18.8	-24.3	32.4	-	1.6	31.1	29.5	
0deg	0.80520	QP	21.8	18.8	-24.2	32.4	-	-16.1	29.5	45.5	
0deg	0.93940	QP	37.6	18.8	-24.2	32.4	-	-0.3	28.1	28.4	
0deg	1.07360	QP	21.5	18.8	-24.2	32.4	-	-16.4	26.9	43.3	
0deg	1.20780	QP	33.6	18.8	-24.2	32.4	-	-4.2	25.9	30.2	
0deg	1.34200	QP	21.3	18.8	-24.2	32.4	-	-16.5	25.0	41.5	
Hori.	30.025	QP	22.6	18.5	7.1	32.3	-	15.9	40.0	24.1	
Hori.	69.943	QP	22.4	6.4	7.8	32.3	-	4.3	40.0	35.7	
Hori.	159.890	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Hori.	300.323	QP	22.7	13.5	10.1	32.1	-	14.2	46.0	31.9	
Hori.	499.788	QP	21.9	17.7	11.4	32.1	-	18.9	46.0	27.1	
Hori.	800.111	QP	22.1	20.7	13.1	31.5	-	24.3	46.0	21.7	
Vert.	30.228	QP	23.2	18.4	7.1	32.3	-	16.4	40.0	23.6	
Vert.	73.021	QP	29.0	6.4	7.8	32.3	-	11.0	40.0	29.1	
Vert.	160.044	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Vert.	300.321	QP	22.6	13.5	10.1	32.1	-	14.1	46.0	32.0	
Vert.	498.899	QP	22.0	17.7	11.4	32.1	-	19.0	46.0	27.1	
Vert.	800.320	QP	22.1	20.7	13.1	31.5	-	24.4	46.0	21.7	

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	66.8	18.9	-74.0	0.0	0.0	11.7	25.0	13.3	Fundamental
0deg	0.26840	PK	40.0	18.9	-64.2	32.3	0.0	-37.7	19.0	56.7	
0deg	0.40260	PK	51.9	18.8	-64.3	32.3	0.0	-25.9	15.5	41.4	

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 3m 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	66.8	18.9	6.0	0.0	-	91.7	-	-	Fundamental

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

As for Gain 0.0 dB shown in the above table, pre-amplifier was not used.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Radiated Emission (Fundamental and Spurious Emission)

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 11, 2021
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Junki Nagatomi
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	73.6	18.9	-74.0	0.0	-	18.5	45.0	26.5	Fundamental
0deg	0.26840	PK	44.6	18.9	-64.2	32.3	-	-33.1	39.0	72.1	
0deg	0.40260	PK	62.5	18.8	-64.3	32.3	-	-15.3	35.5	50.8	
0deg	0.53680	QP	35.8	18.8	-24.3	32.3	-	-2.0	33.0	35.0	
0deg	0.67100	QP	51.2	18.8	-24.3	32.4	-	13.4	31.1	17.7	
0deg	0.80520	QP	22.4	18.8	-24.2	32.4	-	-15.5	29.5	44.9	
0deg	0.93940	QP	39.3	18.8	-24.2	32.4	-	1.4	28.1	26.7	
0deg	1.07360	QP	21.6	18.8	-24.2	32.4	-	-16.3	26.9	43.2	
0deg	1.20780	QP	33.3	18.8	-24.2	32.4	-	-4.6	25.9	30.5	
0deg	1.34200	QP	21.4	18.8	-24.2	32.4	-	-16.4	25.0	41.4	
Hori.	30.001	QP	22.6	18.5	7.1	32.3	-	15.9	40.0	24.1	
Hori.	70.021	QP	22.4	6.4	7.8	32.3	-	4.3	40.0	35.7	
Hori.	160.031	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Hori.	300.002	QP	22.7	13.5	10.1	32.1	-	14.2	46.0	31.9	
Hori.	500.012	QP	21.9	17.7	11.4	32.1	-	18.9	46.0	27.1	
Hori.	800.022	QP	22.1	20.7	13.1	31.5	-	24.3	46.0	21.7	
Vert.	30.021	QP	23.2	18.5	7.1	32.3	-	16.5	40.0	23.5	
Vert.	72.983	QP	31.7	6.4	7.8	32.3	-	13.7	40.0	26.4	
Vert.	159.997	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Vert.	299.890	QP	22.6	13.5	10.1	32.1	-	14.1	46.0	32.0	
Vert.	499.870	QP	22.0	17.7	11.4	32.1	-	19.0	46.0	27.0	
Vert.	800.123	QP	22.1	20.7	13.1	31.5	-	24.3	46.0	21.7	

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	73.6	18.9	-74.0	0.0	0.0	18.5	25.0	6.5	Fundamental
0deg	0.26840	PK	44.6	18.9	-64.2	32.3	0.0	-33.1	19.0	52.1	
0deg	0.40260	PK	62.5	18.8	-64.3	32.3	0.0	-15.3	15.5	30.8	

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 3m 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	73.6	18.9	6.0	0.0	-	98.5	-	-	Fundamental

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

As for Gain 0.0 dB shown in the above table, pre-amplifier was not used.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Radiated Emission (Fundamental and Spurious Emission)

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 11, 2021
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Junki Nagatomi
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	70.4	18.9	-74.0	0.0	-	15.3	45.0	29.7	Fundamental
0deg	0.26840	PK	39.0	18.9	-64.2	32.3	-	-38.7	39.0	77.7	
0deg	0.40260	PK	59.9	18.8	-64.3	32.3	-	-17.9	35.5	53.4	
0deg	0.53680	QP	33.9	18.8	-24.3	32.3	-	-3.9	33.0	36.9	
0deg	0.67100	QP	49.7	18.8	-24.3	32.4	-	11.9	31.1	19.2	
0deg	0.80520	QP	22.4	18.8	-24.2	32.4	-	-15.5	29.5	44.9	
0deg	0.93940	QP	39.8	18.8	-24.2	32.4	-	1.9	28.1	26.2	
0deg	1.07360	QP	21.5	18.8	-24.2	32.4	-	-16.4	26.9	43.3	
0deg	1.20780	QP	31.1	18.8	-24.2	32.4	-	-6.7	25.9	32.7	
0deg	1.34200	QP	21.3	18.8	-24.2	32.4	-	-16.5	25.0	41.5	
Hori.	30.184	QP	22.6	18.4	7.1	32.3	-	15.8	40.0	24.2	
Hori.	69.913	QP	22.4	6.4	7.8	32.3	-	4.3	40.0	35.7	
Hori.	159.990	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Hori.	300.021	QP	22.7	13.5	10.1	32.1	-	14.2	46.0	31.9	
Hori.	499.869	QP	21.9	17.7	11.4	32.1	-	18.9	46.0	27.1	
Hori.	800.320	QP	22.1	20.7	13.1	31.5	-	24.4	46.0	21.7	
Vert.	30.225	QP	23.1	18.4	7.1	32.3	-	16.3	40.0	23.7	
Vert.	68.184	QP	22.8	6.5	7.8	32.3	-	4.8	40.0	35.3	
Vert.	159.709	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Vert.	300.207	QP	22.6	13.5	10.1	32.1	-	14.1	46.0	32.0	
Vert.	499.689	QP	22.0	17.7	11.4	32.1	-	19.0	46.0	27.0	
Vert.	800.210	QP	22.1	20.7	13.1	31.5	-	24.3	46.0	21.7	

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	70.4	18.9	-74.0	0.0	0.0	15.3	25.0	9.6	Fundamental
0deg	0.26840	PK	39.0	18.9	-64.2	32.3	0.0	-38.7	19.0	57.7	
0deg	0.40260	PK	59.9	18.8	-64.3	32.3	0.0	-17.9	15.5	33.4	

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 3m 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	70.4	18.9	6.0	0.0	-	95.3	-	-	Fundamental

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

As for Gain 0.0 dB shown in the above table, pre-amplifier was not used.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Radiated Emission (Fundamental and Spurious Emission)

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 11, 2021
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Junki Nagatomi
Mode	Mode 6

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	63.7	18.9	-74.0	0.0	-	8.6	45.0	36.4	Fundamental
0deg	0.26840	PK	33.9	18.9	-64.2	32.3	-	-43.8	39.0	82.8	
0deg	0.40260	PK	50.1	18.8	-64.3	32.3	-	-27.7	35.5	63.2	
0deg	0.53680	QP	23.9	18.8	-24.3	32.3	-	-13.9	33.0	46.9	
0deg	0.67100	QP	39.1	18.8	-24.3	32.4	-	1.3	31.1	29.8	
0deg	0.80520	QP	24.0	18.8	-24.2	32.4	-	-13.9	29.5	43.3	
0deg	0.93940	QP	32.2	18.8	-24.2	32.4	-	-5.7	28.1	33.8	
0deg	1.07360	QP	24.1	18.8	-24.2	32.4	-	-13.8	26.9	40.7	
0deg	1.20780	QP	27.0	18.8	-24.2	32.4	-	-10.9	25.9	36.8	
0deg	1.34200	QP	24.3	18.8	-24.2	32.4	-	-13.5	25.0	38.5	
Hori.	30.220	QP	22.6	18.4	7.1	32.3	-	15.8	40.0	24.2	
Hori.	69.978	QP	22.5	6.4	7.8	32.3	-	4.4	40.0	35.6	
Hori.	160.219	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Hori.	300.210	QP	22.7	13.5	10.1	32.1	-	14.2	46.0	31.9	
Hori.	499.932	QP	21.9	17.7	11.4	32.1	-	18.9	46.0	27.1	
Hori.	799.889	QP	22.1	20.7	13.1	31.5	-	24.3	46.0	21.7	
Vert.	30.110	QP	23.2	18.4	7.1	32.3	-	16.5	40.0	23.5	
Vert.	69.779	QP	22.7	6.4	7.8	32.3	-	4.6	40.0	35.4	
Vert.	160.199	QP	22.7	15.6	8.8	32.2	-	14.9	43.5	28.6	
Vert.	300.200	QP	22.6	13.5	10.1	32.1	-	14.1	46.0	32.0	
Vert.	500.213	QP	22.0	17.7	11.4	32.1	-	19.0	46.0	27.0	
Vert.	800.123	QP	22.1	20.7	13.1	31.5	-	24.3	46.0	21.7	

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	63.7	18.9	-74.0	0.0	0.0	8.6	25.0	16.4	Fundamental
0deg	0.26840	PK	33.9	18.9	-64.2	32.3	0.0	-43.8	19.0	62.8	
0deg	0.40260	PK	50.1	18.8	-64.3	32.3	0.0	-27.7	15.5	43.2	

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 3m 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	63.7	18.9	6.0	0.0	-	88.6	-	-	Fundamental

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

As for Gain 0.0 dB shown in the above table, pre-amplifier was not used.
Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Radiated Emission (Fundamental and Spurious Emission)

Report No.	13705478H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.3
Date	February 10, 2021	February 10, 2021
Temperature / Humidity	22 deg. C / 46 % RH	22 deg. C / 46 % RH
Engineer	Takafumi Noguchi (Below 30 MHz)	Yuta Moriya (Above 30 MHz)
Mode	Mode 7	

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	79.3	18.9	-74.0	0.0	-	24.2	45.0	20.8	Fundamental
0deg	0.26840	PK	53.0	18.9	-64.2	32.3	-	-24.7	39.0	63.7	
0deg	0.40260	PK	71.8	18.8	-64.3	32.3	-	-6.0	35.5	41.5	
0deg	0.53680	QP	49.1	18.8	-24.3	32.3	-	11.3	33.0	21.7	
0deg	0.67100	QP	53.2	18.8	-24.3	32.4	-	15.4	31.1	15.7	
0deg	0.80520	QP	22.2	18.8	-24.2	32.4	-	-15.7	29.5	45.1	
0deg	0.93940	QP	44.4	18.8	-24.2	32.4	-	6.5	28.1	21.6	
0deg	1.07360	QP	22.1	18.8	-24.2	32.4	-	-15.8	26.9	42.7	
0deg	1.20780	QP	40.8	18.8	-24.2	32.4	-	3.0	25.9	23.0	
0deg	1.34200	QP	21.7	18.8	-24.2	32.4	-	-16.1	25.0	41.1	
Hori.	31.191	QP	22.9	18.0	7.1	32.3	-	15.7	40.0	24.3	
Hori.	49.209	QP	22.1	11.5	7.5	32.3	-	8.8	40.0	31.2	
Hori.	68.761	QP	25.5	6.4	7.8	32.3	-	7.4	40.0	32.6	
Hori.	85.922	QP	26.8	8.0	8.0	32.3	-	10.6	40.0	29.4	
Hori.	151.173	QP	21.7	15.3	8.8	32.2	-	13.5	43.5	30.0	
Hori.	500.000	QP	21.5	17.7	11.4	32.1	-	18.5	46.0	27.5	
Vert.	31.191	QP	22.8	18.0	7.1	32.3	-	15.7	40.0	24.4	
Vert.	49.209	QP	24.4	11.5	7.5	32.3	-	11.1	40.0	28.9	
Vert.	68.761	QP	31.6	6.4	7.8	32.3	-	13.5	40.0	26.5	
Vert.	85.922	QP	25.3	8.0	8.0	32.3	-	9.1	40.0	30.9	
Vert.	151.173	QP	21.7	15.3	8.8	32.2	-	13.5	43.5	30.0	
Vert.	500.000	QP	21.5	17.7	11.4	32.1	-	18.5	46.0	27.5	

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	79.3	18.9	-74.0	0.0	-22.0	2.2	25.0	22.8	Fundamental
0deg	0.26840	PK	53.0	18.9	-64.2	32.3	-22.0	-46.7	19.0	65.7	
0deg	0.40260	PK	71.8	18.8	-64.3	32.3	-22.0	-28.0	15.5	43.5	

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

Result of the fundamental emission at 3m without Distance factor

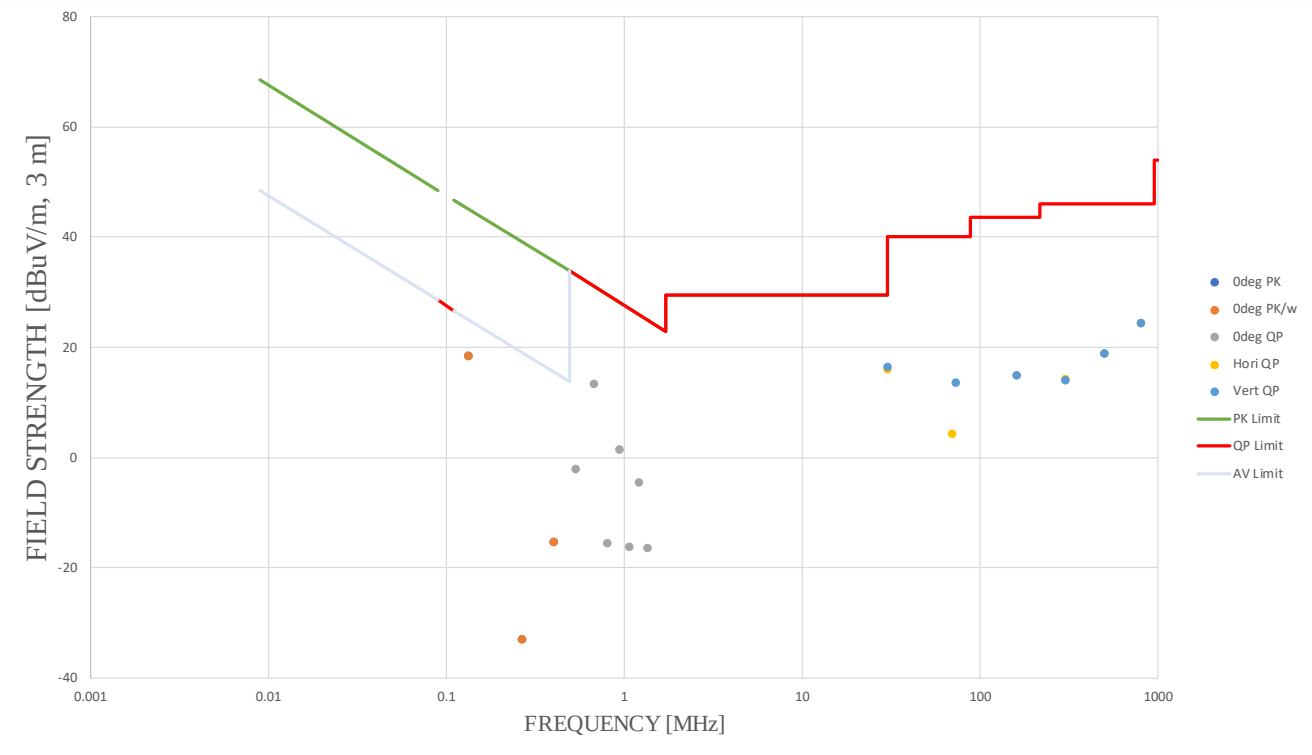
Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.13420	PK	79.3	18.9	6.0	0.0	-	104.2	-	-	Fundamental

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

As for Gain 0.0 dB shown in the above table, pre-amplifier was not used.
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)

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 11, 2021
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Junki Nagatomi
Mode	Mode 4



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Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

Duty Cycle

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 16, 2021
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Akihiko Maeda
Mode	Mode 7

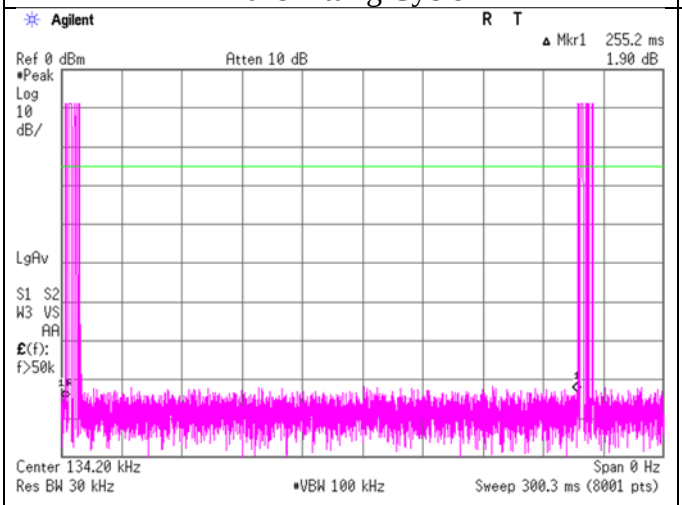
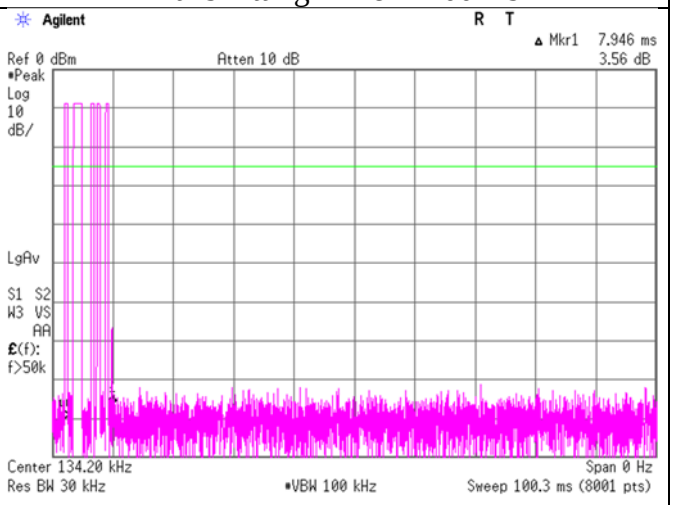
ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty Factor [dB]
7.946	100.00	0.0795	-22.00

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

*Comparing between the "Timing of transmission" in the application document and the actual measured value, the actual measured value is worst, so the above duty factor was applied.

Duty Cycle

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 16, 2021
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Akihiko Maeda
Mode	Mode 7

Transmitting Cycle	Transmitting Time in 100 ms
	

S

-26 dB Bandwidth / 99 % Occupied Bandwidth

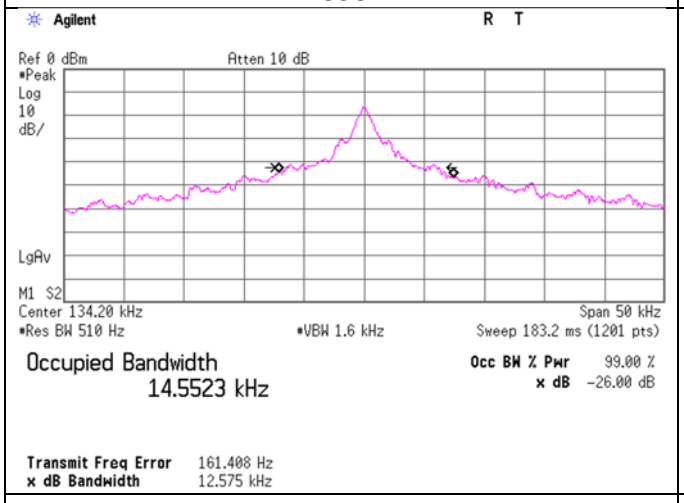
Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 16, 2021
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Akihiko Maeda
Mode	Mode 1 to 7

Mode	-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
Mode 1	12.575	14.5523
Mode 2	12.142	14.3010
Mode 3	12.285	14.2710
Mode 4	12.626	14.4017
Mode 5	12.715	14.9178
Mode 6, With Key	17.854	16.5919
Mode 6, Without Key	17.779	13.9743
Mode 7	10.862	12.4799

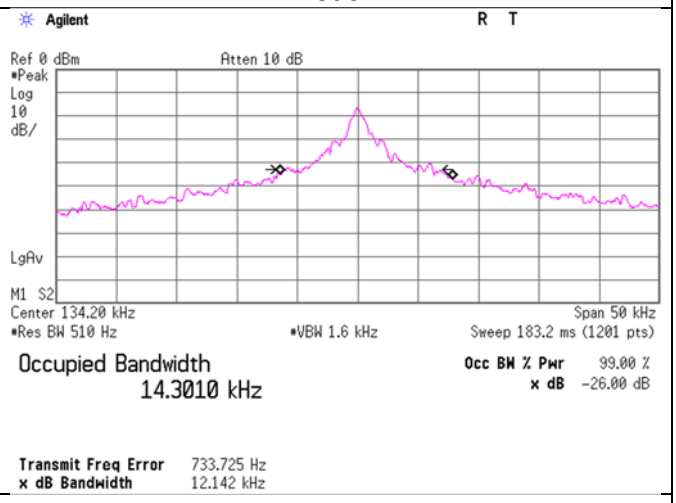
-26 dB Bandwidth / 99 % Occupied Bandwidth

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 16, 2021
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Akihiko Maeda
Mode	Mode 1 to 4

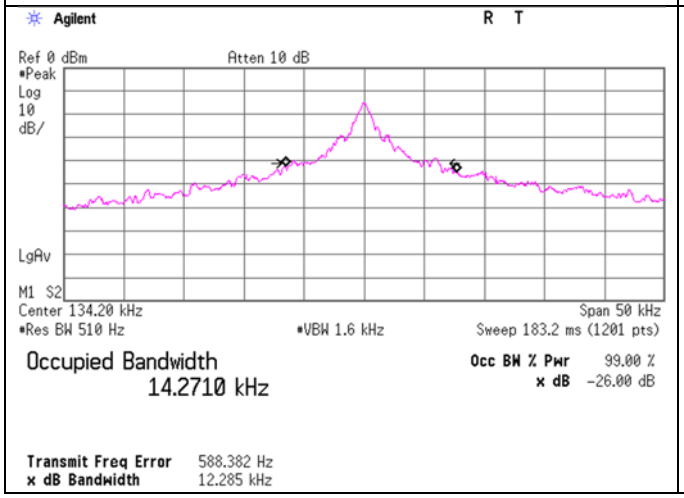
Mode 1



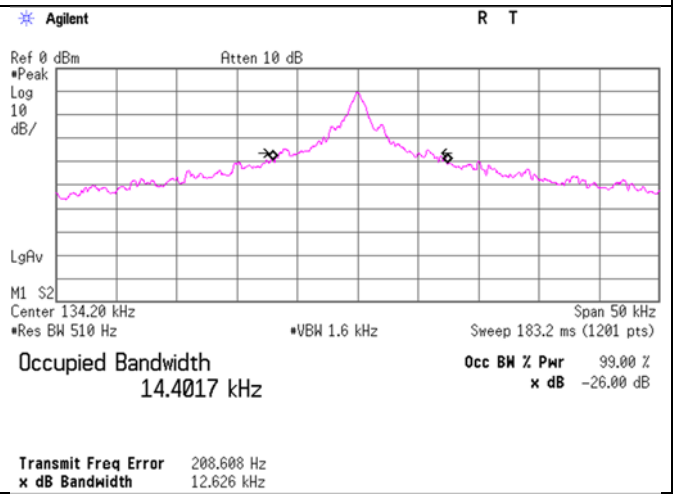
Mode 2



Mode 3



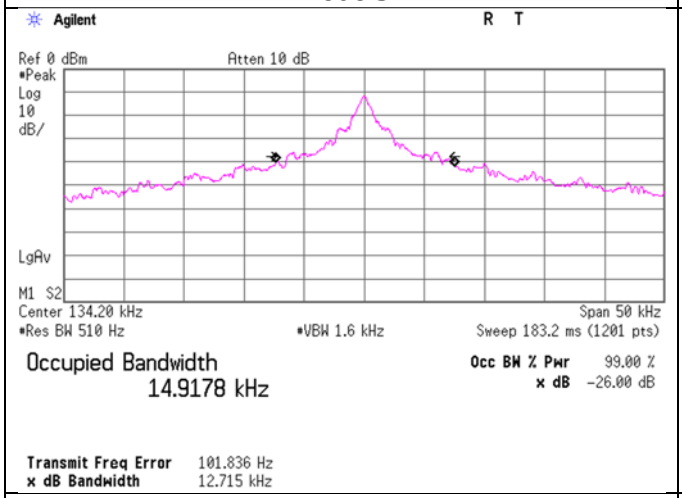
Mode 4



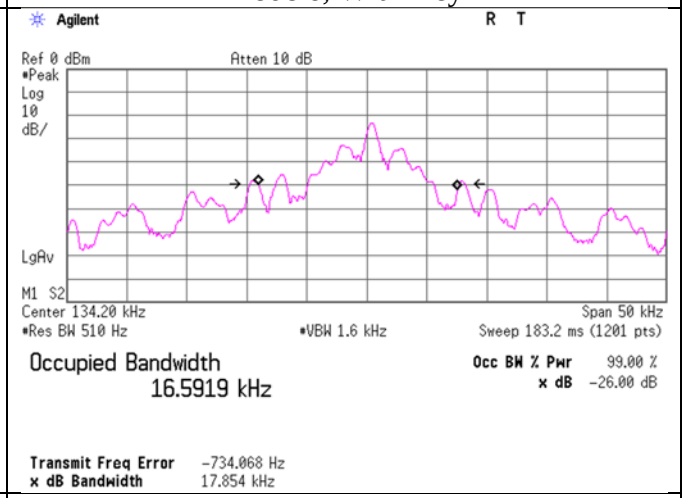
-26 dB Bandwidth / 99 % Occupied Bandwidth

Report No.	13705478H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	February 16, 2021
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Akihiko Maeda
Mode	Mode 5 to 7

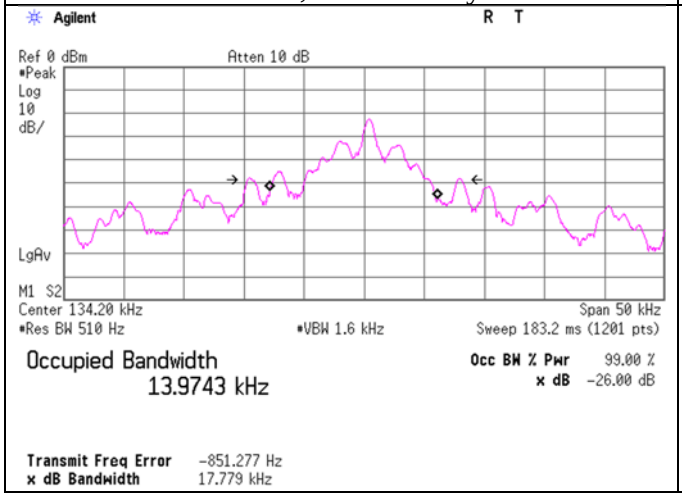
Mode 5



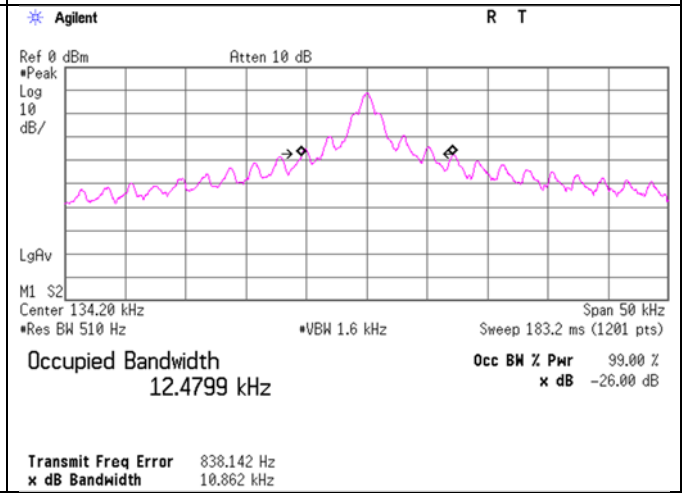
Mode 6, With Key



Mode 6, Without Key



Mode 7



APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MAEC-03	142008	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/22/2020	24
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	01/15/2021	12
RE	MMM-08	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	01/07/2021	12
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAT-95	142314	Attenuator	Pasternack	PE7390-6	D/C 1504	06/17/2020	12
RE	MBA-03	141424	Biconical Antenna	Schwarzbeck	BBA9106	1915	08/13/2020	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	07/06/2020	12
RE	MLA-22	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	08/13/2020	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	11/5/1900	260834	02/03/2021	12
RE	MTR-03	141942	Test Receiver	Rohde & Schwarz	ESCI	100300	08/18/2020	12
RE	MSA-04	141885	Spectrum Analyzer	AGILENT	E4448A	US44300523	11/09/2020	12
RE	MLPA-02	142152	Loop Antenna	Rohde & Schwarz	HFH2-Z2	836553/009	12/04/2020	12
RE	MCC-219	159670	Coaxial Cable	UL Japan Inc.	-	-	11/17/2020	12
RE	MCC-112	141216	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM14/ sucoform141-PE/ 421-010/RFM-E321(SW)	-/00640	07/06/2020	12
RE	MHF-24	141295	High Pass Filter 0.15-30MHz	Rohde & Schwarz	EZ-25/3	100041	02/05/2021	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: Radiated Emission test