



EMI TEST REPORT

Test Report No. : 14006291H-A-R1

Applicant : MIWA LOCK CO., LTD.
Type of EUT : ALV3 Card Encoder without Print Function
Model Number of EUT : DWHL-V3UA01
Test regulation : FCC Part 15 Subpart C: 2021
FCC ID : VBU-DWHLUA01
Test Result : Complied (Refer to SECTION 3)

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan, Inc. has been accredited.
9. The information provided from the customer for this report is identified in Section 1.
10. This report is a revised version of 14006291H-A. 14006291H-A is replaced with this report.

Date of test: October 18 to 31, 2021

Representative test engineer:

Hiroyuki Furutaka
Engineer

Approved by:

Takumi Shimada
Engineer



CERTIFICATE 5107.02

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

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

REVISION HISTORY

Original Test Report No.: 14006291H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	14006291H-A	November 12, 2021	-	-
1	14006291H-A-R1	January 5, 2022	P.7	Correction of the Uncertainty table for Clause 3.4
1	14006291H-A-R1	January 5, 2022	P.23	Addition of the following sentence; Since the transmitter signal is CW-like it is impractical to use a RBW setting of 1 % - 5% of the emission bandwidth since the emission bandwidth will be proportional to the RBW.
1	14006291H-A-R1	January 5, 2022	P.25	Deletion of the following Local ID from the list; MLPA-08 (RE), MCH-04 (RE), MJM-24 (FT)

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Reference: Abbreviations (Including words undescribed in this report)

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

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

CONTENTS	PAGE
SECTION 1: Customer information	5
SECTION 2: Equipment under test (EUT).....	5
SECTION 3: Test specification, procedures & results	6
SECTION 4: Operation of EUT during testing.....	9
SECTION 5: Conducted Emission.....	11
SECTION 6: Radiated emission (Fundamental, Spurious Emission and Spectrum Mask).....	12
SECTION 7: Other test.....	14
APPENDIX 1: Test data	15
Conducted Emission	15
Fundamental emission and Spectrum Mask.....	18
Spurious emission	20
20 dB Bandwidth and 99% Occupied Bandwidth	23
Frequency Tolerance.....	24
APPENDIX 2: Test instruments	25
APPENDIX 3: Photographs of test setup	27
Conducted Emission	27
Radiated Emission	28
Worst Case Position.....	29
Frequency Tolerance.....	31

SECTION 1: Customer information

Company Name	:	MIWA LOCK CO., LTD.
Address	:	3-1-12, Shiba, Minato-ku, Tokyo, 105-8510, Japan
Telephone Number	:	+81- 3-4330-3069
Contact Person	:	Tatsuya Nakamura

The information provided from the customer is as follows;

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

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

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Type	:	ALV3 Card Encoder without Print Function
Model Number	:	DWHL-V3UA01
Serial Number	:	Refer to SECTION 4.2
Receipt Date	:	October 11, 2021
Condition	:	Production prototype
		(Not for Sale: This sample is equivalent to mass-produced items.)
Modification	:	No Modification by the test lab

2.2 Product Description

Model: DWHL-V3UA01 (referred to as the EUT in this report) is a ALV3 Card Encoder without Print Function.

General Specification

Rating	:	DC 5.0 V
--------	---	----------

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	13.56 MHz
Modulation	:	ASK
Antenna type	:	Printed Loop Antenna
Antenna Gain	:	-46.5 dBi
Clock frequency (Maximum)	:	27.12 MHz
Operating Temperature	:	0 deg. C to +40 deg. C

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.225 Operation within the band 13.110-14.010 MHz.

* Also the EUT complies with FCC Part 15 Subpart B.

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	9.95 dB 0.15000 MHz QP, Phase L	Complied a)	-
Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.10:2013 6 Standard test methods ----- <ISED> RSS-Gen 6.4, 6.12	<FCC> Section 15.225(a) ----- <ISED> RSS-210 B.6	55.23 dB, 13.56000 MHz, QP, 0 deg. <without Tag>	Complied b)	Radiated
Spectrum Mask	<FCC> ANSI C63.10:2013 6 Standard test methods ----- <ISED> RSS-Gen 6.4, 6.13	<FCC> Section 15.225(b)(c) ----- <ISED> RSS-210 B.6	27.48 dB, 14.08980 MHz, QP, 0 deg. <without Tag>	Complied b)	Radiated
20 dB Bandwidth	<FCC> ANSI C63.10:2013 6 Standard test methods ----- <ISED> -	<FCC> Section15.215(c) ----- <ISED> -	See data	Complied c)	Radiated
Electric Field Strength of Spurious Emission	<FCC> ANSI C63.10:2013 6 Standard test methods ----- <ISED> RSS-Gen 6.4, 6.13	<FCC> Section 15.209, Section 15.225 (d) ----- <ISED> RSS-210 B.6 RSS-Gen 8.9	0.14 dB 40.680 MHz, Vertical, QP	Complied# d)	Radiated
Frequency Tolerance	<FCC> ANSI C63.10:2013 6 Standard test methods ----- <ISED> RSS-Gen 6.11, 8.11	<FCC> Section 15.225(e) ----- <ISED> RSS-210 B.6	See data	Complied e)	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422					
a) Refer to APPENDIX 1 (data of Conducted Emission)					
b) Refer to APPENDIX 1 (data of Fundamental emission and Spectrum Mask)					
c) Refer to APPENDIX 1 (data of 20 dB Bandwidth and 99% Occupied Bandwidth)					
d) Refer to APPENDIX 1 (data of Spurious emission)					
e) Refer to APPENDIX 1 (data of Frequency Tolerance)					
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.					

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

FCC Part 15.31 (e)

This EUT provides stable voltage constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

However, the supply voltage was varied and tested at 85 % and 115 % of the nominal rated supply voltage during frequency tolerance test according to Section 15.225(e).

FCC Part 15.203 Antenna requirement

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

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99 % Occupied Band Width	<ISED>RSS-Gen 6.7	-	N/A	-	Radiated

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

3.4 Uncertainty

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

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

Test Item		Frequency range	Uncertainty (+/-)
Conducted emission AMN (LISN)		0.009 MHz to 0.15 MHz	3.4 dB
		0.15 MHz to 30 MHz	2.9 dB
Radiated emission	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
Frequency Tolerance		-	0.0154 ppm
20 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: 884919

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

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

Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

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	-	-

* 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.

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

The mode is used :

Mode	Remarks*
1) Transmitting mode (Tx) - Without Tag - With Tag	The EUT Transmits and Receives at the same time and there is no receiving mode.
The EUT was operated in a manner similar to typical use during the tests. * EUT was set by the software as follows; Software: NFC-RW RF test firmware Version 004 (Date: 2020.09.15, 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.	

Test Item	Operating mode*
Conducted Emission	Tx Mod on Terminated
Electric Field Strength of Fundamental Emission	Tx Mod on
Spectrum Mask	
20 dB Bandwidth and 99 % Occupied Bandwidth	
Electric Field Strength of Spurious Emission	
Frequency Tolerance	Tx Mod off

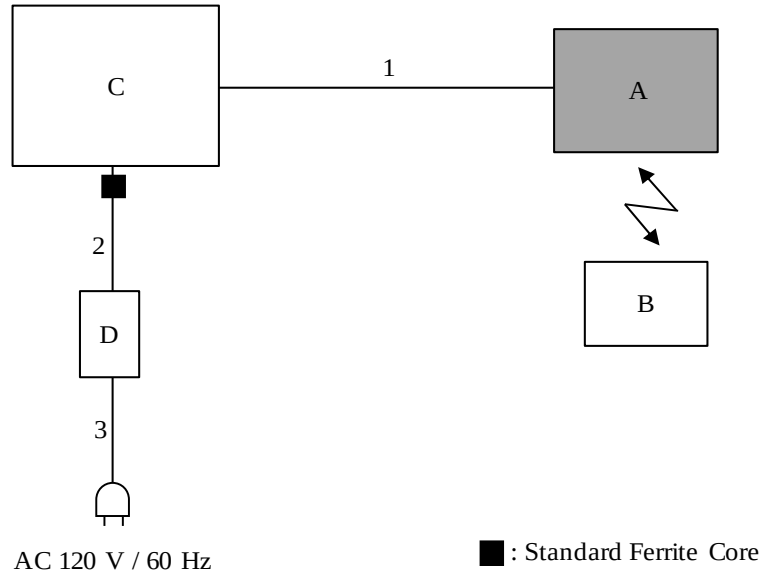
Justification: The system was configured in typical fashion (as a user would normally use it) for testing.

Frequency Tolerance:

Temperature : -20 deg. C to +50 deg. C Step 10 deg. C (-30 deg. C: Reference)
 Voltage : Normal Voltage DC 5 V
 Maximum Voltage DC 5.75 V,
 Minimum Voltage DC 4.25 V (DC 5 V $\pm$ 15 %)

*This EUT provides stable voltage constantly to RF Part regardless of input voltage

4.2 Configuration and peripherals



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

*As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 120 V of the worst voltage as representative.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	ALV3 Card Encoder without Print Function	DWHL-V3UA01	V00048A	MIWA LOCK CO., LTD.	EUT
B	Tag	-	MICSHA012	MIWA LOCK CO., LTD.	-
C	Laptop PC	CF-MX3	C01191000765	Panasonic	-
D	AC Adapter	CF-AA62J2C	62J2CM315X016346SA	Panasonic	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	0.95	Shielded	Shielded	-
2	DC Cable	1.60	Unshielded	Unshielded	-
3	AC Cable	0.90	Unshielded	Unshielded	-

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane.

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

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

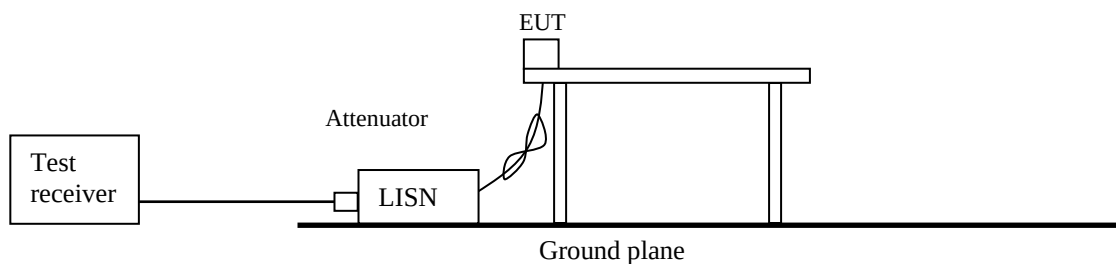
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected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

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

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

[Test Setup]



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

Detector	: QP and CISPR AV
Measurement range	: 0.15 MHz - 30 MHz
Test data	: APPENDIX
Test result	: Pass

SECTION 6: Radiated emission (Fundamental, Spurious Emission and Spectrum Mask)

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., 135 deg., and 180 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: $40 \times \log(3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

*2) Distance Factor: $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

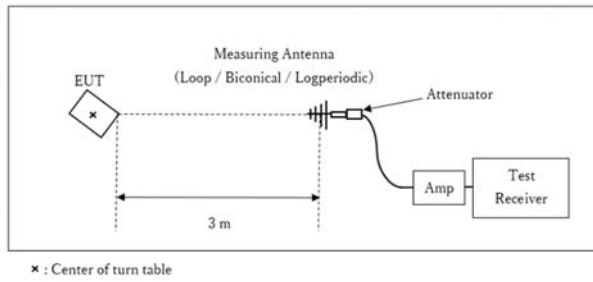
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open 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 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to $45.5 - 51.5 = -6.0 \text{ dBuA/m}$, 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 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.

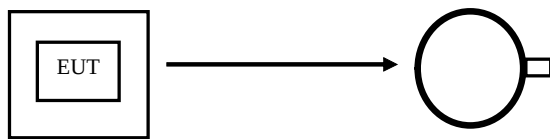
Measurement range : 9 kHz - 1 GHz
Test data : APPENDIX 1
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

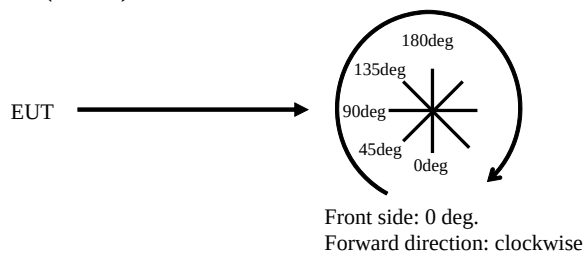


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	5 MHz	30 kHz	91 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Sample	Clear Write (Single)	Spectrum Analyzer *1)
Frequency Tolerance	-	-	-	-	-	-	Spectrum Analyzer *2)

*1) The measurement was performed with Sample detector, Clear Write (Single) since the duty cycle was 100 %.

*2) The measurement was performed with Marker Frequency Counter Function.

Test data : APPENDIX

Test result : Pass

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

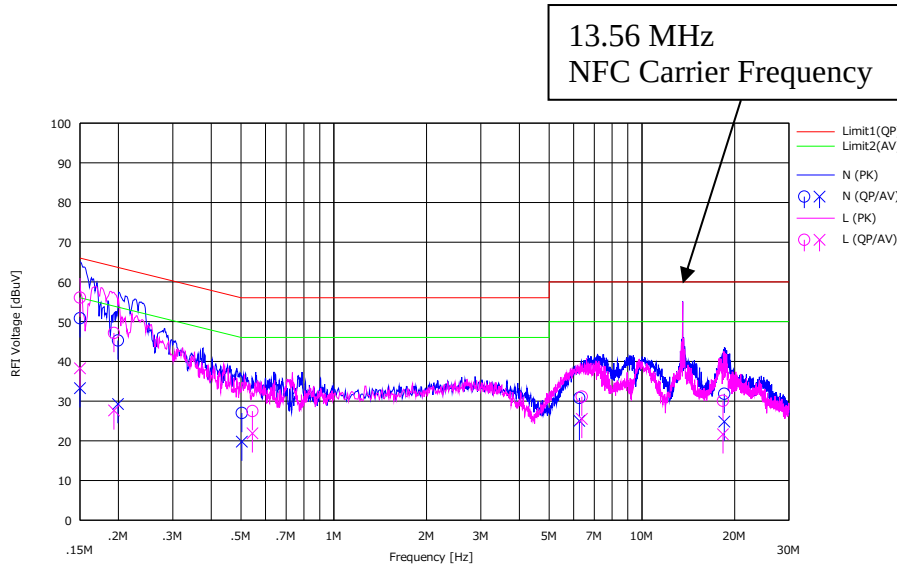
Facsimile : +81 596 24 8124

APPENDIX 1: Test data

Conducted Emission

Report No. 14006291H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 21, 2021
Temperature / Humidity 23 deg. C / 49 % RH
Engineer Nachi Konegawa
Mode Tx Mod on, without Tag

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	Results		Limit		Margin		Phase	Comment
		[QP] [dBuV]	[AV] [dBuV]			[QP] [dBuV]	[AV] [dBuV]	[QP] [dBuV]	[AV] [dBuV]	[QP] [dB]	[AV] [dB]		
1	0.15000	37.60	20.00	0.06	13.19	50.85	33.25	66.00	56.00	15.15	22.75	N	
2	0.19930	32.00	16.00	0.07	13.20	45.27	29.27	63.64	53.64	18.37	24.37	N	
3	0.50280	13.70	6.50	0.06	13.23	26.99	19.79	56.00	46.00	29.01	26.21	N	
4	6.26600	17.10	11.30	0.16	13.55	30.81	25.01	60.00	50.00	29.19	24.99	N	
5	18.50900	17.60	10.60	0.35	13.88	31.83	24.83	60.00	50.00	28.17	25.17	N	
6	0.15000	42.80	25.00	0.06	13.19	56.05	38.25	66.00	56.00	9.95	17.75	L	
7	0.19335	33.90	14.40	0.05	13.20	47.15	27.65	63.89	53.89	16.74	26.24	L	
8	0.54420	14.20	8.60	0.05	13.23	27.48	21.88	56.00	46.00	28.52	24.12	L	
9	6.38000	17.40	11.80	0.15	13.56	31.11	25.51	60.00	50.00	28.89	24.49	L	
10	18.32300	15.80	7.40	0.38	13.88	30.06	21.66	60.00	50.00	29.94	28.34	L	

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

UL Japan, Inc.

Ise EMC Lab.

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

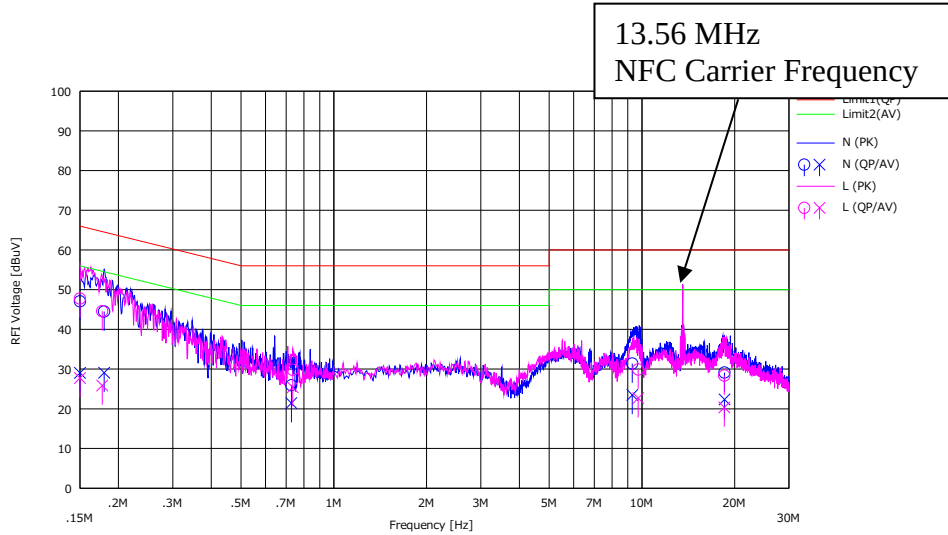
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Report No. 14006291H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 21, 2021
Temperature / Humidity 23 deg. C / 49 % RH
Engineer Nachi Konegawa
Mode Tx Mod on, with Tag

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	Results		Limit		Margin		Phase	Comment
		[QP] [dBuV]	[AV] [dBuV]			[QP] [dBuV]	[AV] [dBuV]	[QP] [dBuV]	[AV] [dBuV]	[QP] [dB]	[AV] [dB]		
1	0.15000	33.80	15.80	0.06	13.19	47.05	29.05	66.00	56.00	18.95	26.95	N	
2	0.17975	31.20	15.80	0.07	13.20	44.47	29.07	64.50	54.50	20.03	25.43	N	
3	0.72800	12.60	8.10	0.06	13.25	25.91	21.41	56.00	46.00	30.09	24.59	N	
4	9.30400	17.50	9.60	0.21	13.66	31.37	23.47	60.00	50.00	28.63	26.53	N	
5	18.52800	14.90	8.10	0.35	13.88	29.13	22.33	60.00	50.00	30.87	27.67	N	
6	0.15000	34.50	14.50	0.06	13.19	47.75	27.75	66.00	56.00	18.25	28.25	L	
7	0.17720	31.30	12.60	0.05	13.20	44.55	25.85	64.62	54.62	20.07	28.77	L	
8	0.73534	16.50	12.10	0.05	13.25	29.80	25.40	56.00	46.00	26.20	20.60	L	
9	9.72400	16.00	8.80	0.21	13.67	29.88	22.68	60.00	50.00	30.12	27.32	L	
10	18.51200	14.10	6.10	0.38	13.88	28.36	20.36	60.00	50.00	31.64	29.64	L	

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

UL Japan, Inc.

Ise EMC Lab.

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

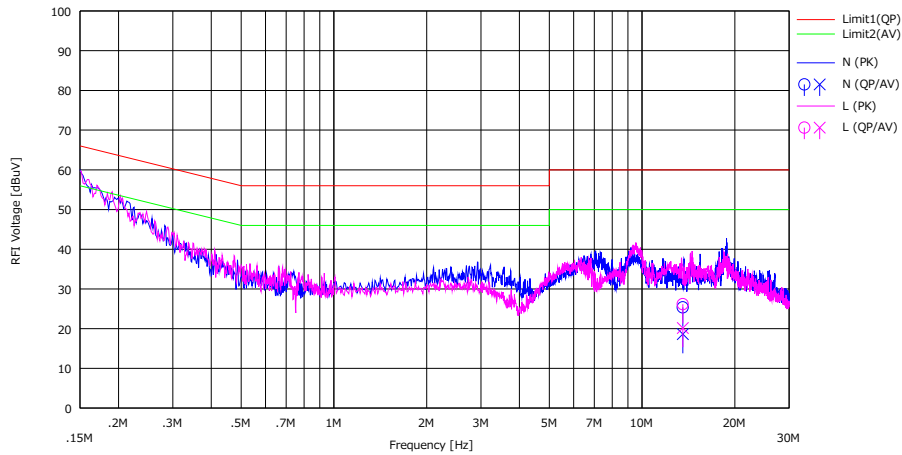
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Report No. 14006291H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 31, 2021
Temperature / Humidity 22 deg. C / 54 % RH
Engineer Hiroyuki Furutaka
Mode Antenna Terminated

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		USN	LOSS	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]			<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	13.56000	11.30	4.60	0.27	13.77	25.34	18.64	60.00	50.00	34.66	31.36	N	
2	13.56000	12.10	6.10	0.29	13.77	26.16	20.16	60.00	50.00	33.84	29.84	L	

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

UL Japan, Inc.

Ise EMC Lab.

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

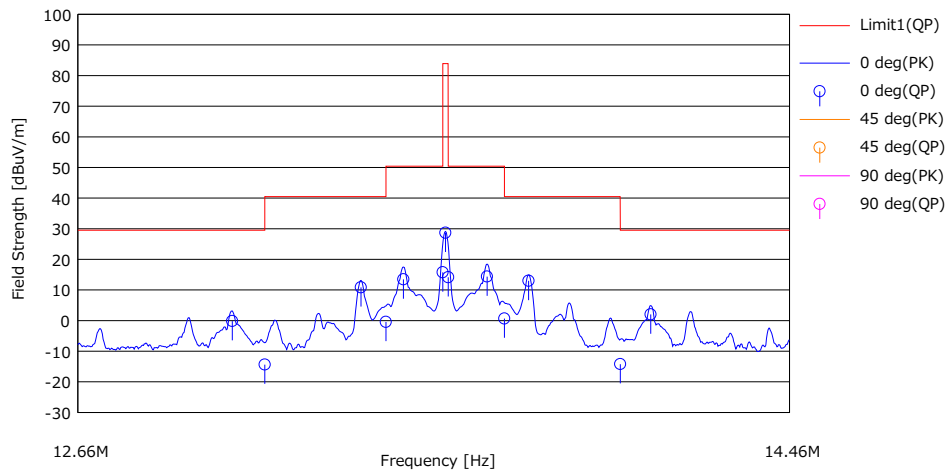
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Fundamental emission and Spectrum Mask

Report No. 14006291H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date October 18, 2021
Temperature / Humidity 24 deg. C / 45 % RH
Engineer Hiroyuki Furutaka
Mode Tx Mod on, without Tag

Limit : FCC15.225(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



No.	Freq. [MHz]	Reading <QP>	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result <QP>	Limit <QP>	Margin <QP>	Antenna [deg]	Table [deg]	Comment
		[dBuV]				[dBuV/m]	[dBuV/m]	[dB]			
1	13.03046	45.80	19.26	-32.90	32.32	-0.16	29.50	29.66	0 deg	183	
2	13.11000	31.60	19.26	-32.90	32.32	-14.36	29.50	43.86	0 deg	183	
3	13.34759	56.80	19.26	-32.89	32.32	10.85	40.50	29.65	0 deg	183	
4	13.41000	45.50	19.27	-32.88	32.32	-0.43	40.50	40.93	0 deg	183	
5	13.45401	59.40	19.27	-32.88	32.32	13.47	50.40	36.93	0 deg	183	
6	13.55300	61.70	19.27	-32.88	32.32	15.77	50.40	34.63	0 deg	183	
7	13.56000	74.60	19.27	-32.88	32.32	28.67	83.90	55.23	0 deg	183	
8	13.56700	60.10	19.27	-32.88	32.32	14.17	50.40	36.23	0 deg	183	
9	13.66570	60.30	19.27	-32.87	32.32	14.38	50.40	36.02	0 deg	183	
10	13.71000	46.60	19.27	-32.87	32.32	0.68	40.50	39.82	0 deg	183	
11	13.77217	58.90	19.27	-32.86	32.32	12.99	40.50	27.51	0 deg	183	
12	14.01000	31.70	19.28	-32.85	32.32	-14.19	29.50	43.69	0 deg	183	
13	14.08980	47.90	19.28	-32.84	32.32	2.02	29.50	27.48	0 deg	183	

RESULT = READING + ANT FACTOR + LOSS (CABLE + Attenuator + Distance Factor*) - GAIN(AMP)

*) Distance Factor: $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

Result of the fundamental emission at 3 m without Distance factor

QP											
Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	74.60	19.27	7.12	32.32	-	68.67	-	-	Fundamental

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

UL Japan, Inc.

Ise EMC Lab.

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

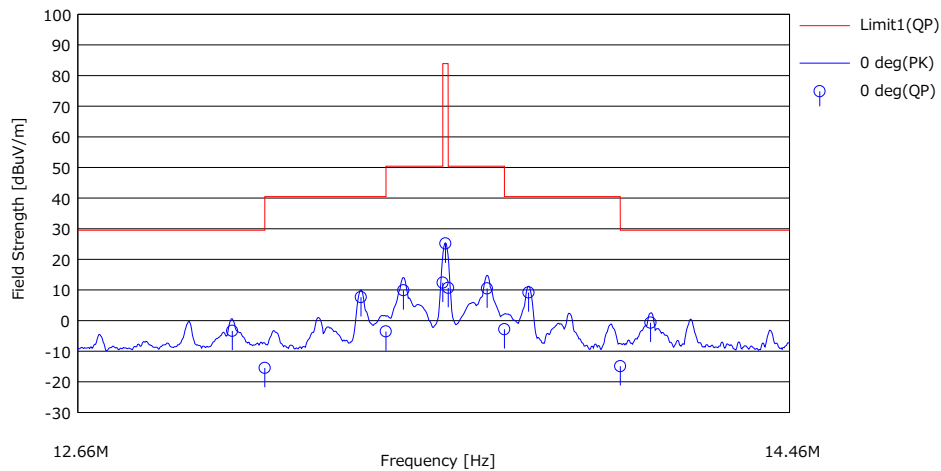
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Fundamental emission and Spectrum Mask

Report No. 14006291H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date October 18, 2021
Temperature / Humidity 24 deg. C / 45 % RH
Engineer Hiroyuki Furutaka
Mode Tx Mod on, with Tag

Limit : FCC15.225(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



No.	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]		[deg]	
1	13.03046	42.60	19.26	-32.90	32.32	-3.36	29.50	32.86	0 deg	183	
2	13.11000	30.50	19.26	-32.90	32.32	-15.46	29.50	44.96	0 deg	183	
3	13.34749	53.60	19.26	-32.89	32.32	7.65	40.50	32.85	0 deg	183	
4	13.41000	42.40	19.27	-32.88	32.32	-3.53	40.50	44.03	0 deg	183	
5	13.45390	55.80	19.27	-32.88	32.32	9.87	50.40	40.53	0 deg	183	
6	13.55300	58.30	19.27	-32.88	32.32	12.37	50.40	38.03	0 deg	183	
7	13.56000	71.10	19.27	-32.88	32.32	25.17	83.90	58.73	0 deg	183	
8	13.56700	56.60	19.27	-32.88	32.32	10.67	50.40	39.73	0 deg	183	
9	13.66574	56.40	19.27	-32.87	32.32	10.48	50.40	39.92	0 deg	183	
10	13.71000	43.10	19.27	-32.87	32.32	-2.82	40.50	43.32	0 deg	183	
11	13.77215	55.10	19.27	-32.86	32.32	9.19	40.50	31.31	0 deg	183	
12	14.01000	31.00	19.28	-32.85	32.32	-14.89	29.50	44.39	0 deg	183	
13	14.08948	45.20	19.28	-32.84	32.32	-0.68	29.50	30.18	0 deg	183	

RESULT = READING + ANT FACTOR + LOSS (CABLE + Attenuator + Distance Factor*) - GAIN(AMP)

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

Result of the fundamental emission at 3 m without Distance factor

Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	71.10	19.27	7.12	32.32	-	65.17	-	-	Fundamental

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

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Spurious emission

Report No. 14006291H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date October 18, 2021 No.1
Temperature / Humidity 22 deg. C / 43 % RH October 18, 2021
Engineer Hiroyuki Furutaka Takafumi Noguchi
(Below 30 MHz) (Above 30 MHz)
Mode Tx Mod on, without Tag

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	0.747	QP	49.80	18.78	-33.88	32.37	-	2.33	30.1	27.78	
0deg	1.494	QP	38.60	18.80	-33.76	32.40	-	-8.76	24.1	32.81	
0deg	27.120	QP	30.30	19.43	-32.30	32.28	-	-14.85	29.5	44.35	
Hori.	40.680	QP	33.50	14.46	7.52	38.72	-	16.76	40.0	23.24	*
Hori.	70.894	QP	41.00	6.41	8.09	38.78	-	16.72	40.0	23.28	*
Hori.	136.518	QP	30.00	14.13	9.02	38.87	-	14.28	43.5	29.24	*
Hori.	162.718	QP	37.90	15.45	9.33	38.88	-	23.80	43.5	19.72	*
Hori.	276.483	QP	33.90	14.27	10.48	38.70	-	19.95	46.0	26.07	*
Hori.	305.904	QP	37.70	14.28	10.75	38.63	-	24.10	46.0	21.92	*
Vert.	40.680	QP	40.50	14.46	7.52	38.72	-	23.76	40.0	16.24	*
Vert.	70.894	QP	45.20	6.41	8.09	38.78	-	20.92	40.0	19.08	*
Vert.	136.518	QP	39.70	14.13	9.02	38.87	-	23.98	43.5	19.54	*
Vert.	162.718	QP	41.60	15.45	9.33	38.88	-	27.50	43.5	16.02	*
Vert.	276.483	QP	30.00	14.27	10.48	38.70	-	16.05	46.0	29.97	*
Vert.	305.904	QP	32.40	14.28	10.75	38.63	-	18.80	46.0	27.22	*

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

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

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Spurious emission

Report No.	14006291H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.1	No.1
Date	October 18, 2021	October 18, 2021
Temperature / Humidity	22 deg. C / 43 % RH	22 deg. C / 46 % RH
Engineer	Hiroyuki Furutaka (Below 30 MHz)	Takafumi Noguchi (Above 30 MHz)
Mode	Tx Mod on, with Tag	

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	0.745	QP	49.00	18.78	-33.88	32.37	-	1.53	30.1	28.61	
0deg	1.495	QP	40.00	18.80	-33.76	32.40	-	-7.36	24.1	31.41	
0deg	27.120	QP	31.00	19.43	-32.30	32.28	-	-14.15	29.5	43.65	
Hori.	40.680	QP	45.50	14.46	7.52	38.72	-	28.76	40.0	11.24	*
Hori.	67.800	QP	54.30	6.55	8.04	38.77	-	30.12	40.0	9.88	*
Hori.	149.160	QP	42.50	14.86	9.18	38.88	-	27.66	43.5	15.86	*
Hori.	176.280	QP	51.10	15.99	9.48	38.89	-	37.68	43.5	5.84	*
Hori.	366.120	QP	37.00	15.37	11.23	38.48	-	25.12	46.0	20.90	*
Hori.	393.240	QP	39.70	16.14	11.44	38.41	-	28.87	46.0	17.15	*
Vert.	40.680	QP	56.60	14.46	7.52	38.72	-	39.86	40.0	0.14	*
Vert.	67.800	QP	56.80	6.55	8.04	38.77	-	32.62	40.0	7.38	*
Vert.	149.160	QP	44.00	14.86	9.18	38.88	-	29.16	43.5	14.36	*
Vert.	176.280	QP	46.40	15.99	9.48	38.89	-	32.98	43.5	10.54	*
Vert.	366.120	QP	41.80	15.37	11.23	38.48	-	29.92	46.0	16.10	*
Vert.	393.240	QP	38.60	16.14	11.44	38.41	-	27.77	46.0	18.25	*

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

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

UL Japan, Inc.

Ise EMC Lab.

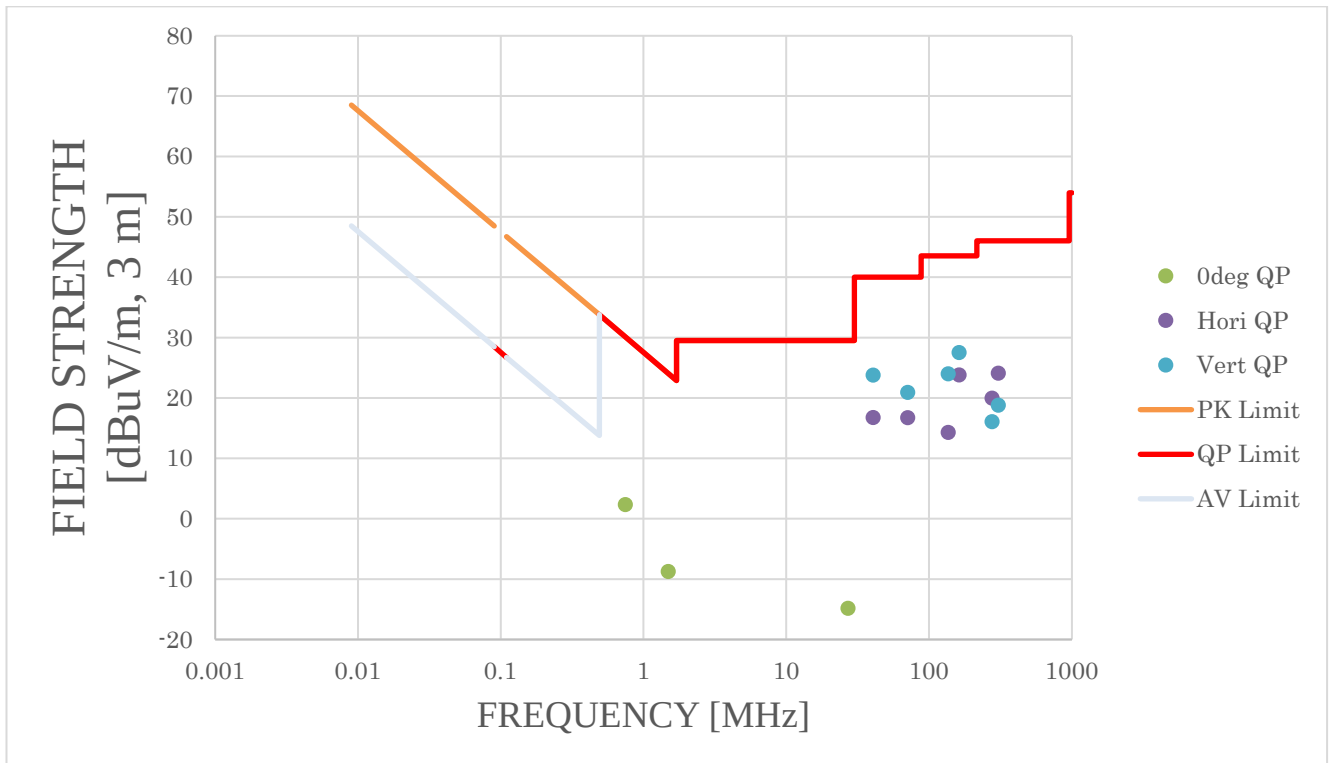
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Emission Plot data, Worst case

Report No.	14006291H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.1	No.1
Date	October 18, 2021	October 18, 2021
Temperature / Humidity	22 deg. C / 43 % RH	22 deg. C / 46 % RH
Engineer	Hiroyuki Furutaka (Below 30 MHz)	Takafumi Noguchi (Above 30 MHz)
Mode	Tx Mod on, without Tag	

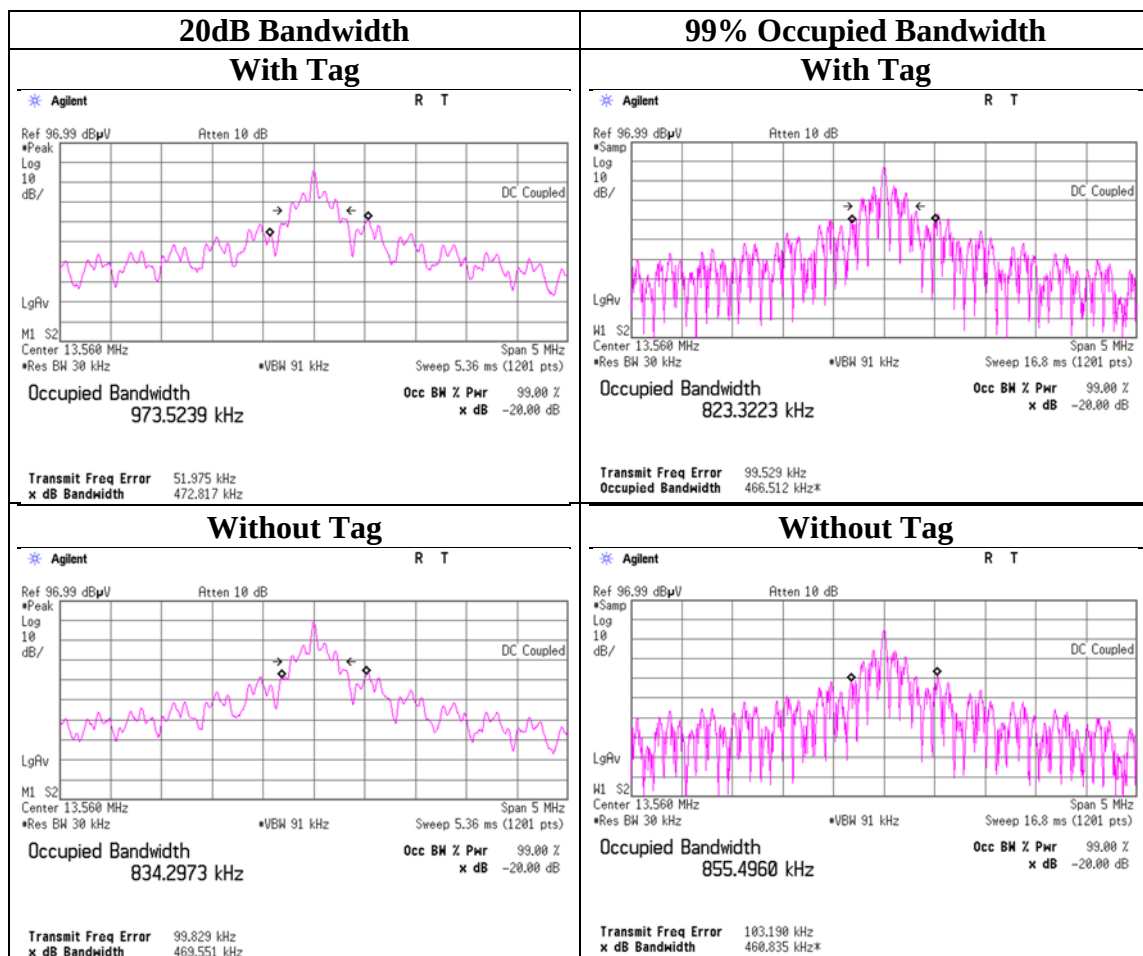


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

20 dB Bandwidth and 99% Occupied Bandwidth

Report No.	14006291H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	October 18, 2021
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Hiroyuki Furutaka
Mode	Tx Mod on

FREQ [MHz]	Mode	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	With Tag	472.82	823.32
	Without Tag	469.55	855.50



Since the transmitter signal is CW-like it is impractical to use a RBW setting of 1 % - 5% of the emission bandwidth since the emission bandwidth will be proportional to the RBW.

Frequency Tolerance

Report No. 14006291H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.6
Date October 21, 2021
Temperature / Humidity 24 deg. C / 41 % RH
Engineer Hiroyuki Furutaka
Mode Tx Mod off

Test condition		Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit
Temp. [deg. C]	Voltage [V]				[%]	[ppm]	
50	5	Power on	13.559743	-0.000257	-0.00190	-19.0	0.01
		+ 2 min.	13.559744	-0.000256	-0.00189	-18.9	0.01
		+ 5 min.	13.559744	-0.000256	-0.00188	-18.8	0.01
		+ 10 min.	13.559745	-0.000255	-0.00188	-18.8	0.01
40	5	Power on	13.559739	-0.000261	-0.00192	-19.2	0.01
		+ 2 min.	13.559735	-0.000265	-0.00195	-19.5	0.01
		+ 5 min.	13.559735	-0.000265	-0.00195	-19.5	0.01
		+ 10 min.	13.559735	-0.000265	-0.00196	-19.6	0.01
30	5	Power on	13.559745	-0.000255	-0.00188	-18.8	0.01
		+ 2 min.	13.559744	-0.000256	-0.00189	-18.9	0.01
		+ 5 min.	13.559744	-0.000256	-0.00189	-18.9	0.01
		+ 10 min.	13.559744	-0.000256	-0.00189	-18.9	0.01
20	5	Power on	13.559764	-0.000236	-0.00174	-17.4	0.01
		+ 2 min.	13.559762	-0.000238	-0.00176	-17.6	0.01
		+ 5 min.	13.559762	-0.000238	-0.00176	-17.6	0.01
		+ 10 min.	13.559762	-0.000238	-0.00176	-17.6	0.01
20	4.25 (5V -15%)	Power on	13.559762	-0.000238	-0.00175	-17.5	0.01
		+ 2 min.	13.559763	-0.000237	-0.00175	-17.5	0.01
		+ 5 min.	13.559763	-0.000237	-0.00175	-17.5	0.01
		+ 10 min.	13.559764	-0.000236	-0.00174	-17.4	0.01
20	5.75 (5V +15%)	Power on	13.559767	-0.000233	-0.00172	-17.2	0.01
		+ 2 min.	13.559762	-0.000238	-0.00175	-17.5	0.01
		+ 5 min.	13.559761	-0.000239	-0.00176	-17.6	0.01
		+ 10 min.	13.559761	-0.000239	-0.00176	-17.6	0.01
10	5	Power on	13.559787	-0.000213	-0.00157	-15.7	0.01
		+ 2 min.	13.559784	-0.000216	-0.00159	-15.9	0.01
		+ 5 min.	13.559784	-0.000216	-0.00159	-15.9	0.01
		+ 10 min.	13.559784	-0.000216	-0.00160	-16.0	0.01
0	5	Power on	13.559796	-0.000204	-0.00150	-15.0	0.01
		+ 2 min.	13.559797	-0.000203	-0.00149	-14.9	0.01
		+ 5 min.	13.559798	-0.000202	-0.00149	-14.9	0.01
		+ 10 min.	13.559798	-0.000202	-0.00149	-14.9	0.01
-10	5	Power on	13.559782	-0.000218	-0.00160	-16.0	0.01
		+ 2 min.	13.559786	-0.000214	-0.00158	-15.8	0.01
		+ 5 min.	13.559786	-0.000214	-0.00158	-15.8	0.01
		+ 10 min.	13.559787	-0.000213	-0.00157	-15.7	0.01
-20	5	Power on	13.559693	-0.000307	-0.00226	-22.6	0.01
		+ 2 min.	13.559721	-0.000279	-0.00206	-20.6	0.01
		+ 5 min.	13.559736	-0.000264	-0.00194	-19.4	0.01
		+ 10 min.	13.559745	-0.000255	-0.00188	-18.8	0.01
-30*	5	Power on	13.559619	-0.000381	-0.00281	-28.1	0.01
		+ 2 min.	13.559660	-0.000340	-0.00250	-25.0	0.01
		+ 5 min.	13.559670	-0.000330	-0.00243	-24.3	0.01
		+ 10 min.	13.559677	-0.000323	-0.00238	-23.8	0.01

Calculation formula: Frequency error = Measured frequency - Tested frequency
Result [%] = Frequency error / Tested frequency * 100

Tested frequency: 13.56 MHz
Limit (+/-): 0.01 % (+/- 100ppm)

The test was begun from 50 deg.C and the temperature was lowered each 10 deg.C.

* for IC application (RSS-Gen 6.11 requirement)

APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
CE	MAEC-04	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/25/2020	24
CE	MOS-15	141562	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0010	01/15/2021	12
CE	MMM-10	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	01/07/2021	12
CE	MJM-29	142230	Measure	KOMELON	KMC-36	-	-	-
CE	COTS-ME MI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
CE	MTR-08	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/05/2021	12
CE	MLS-24	141358	LISN(AMN)	Schwarzbeck Mess-Elektronik OHG	NSLK8127	8127-730	07/18/2021	12
CE	MAT-67	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/07/2020	12
CE	MCC-113	141217	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM141/421-010/sucoform141-PE/RFM-E121(SW)	-/04178	06/02/2021	12
CE	MLS-23	141357	LISN(AMN)	Schwarzbeck Mess-Elektronik OHG	NSLK8127	8127-729	07/18/2021	12
RE	MAEC-01	141998	AC1_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	06/08/2020	24
RE	MOS-27	141566	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	A08Q26	01/15/2021	12
RE	MMM-03	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	08/10/2021	12
RE	MJM-25	142226	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-ME MI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MLPA-01	141254	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	04/17/2021	12
RE	MCC-255	207745	Coaxial Cable	UL Japan Inc.	-	-	05/17/2021	12
RE	MCC-03	141215	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W/3D-2W/RG400u/RFM-E421(SW)	-/01068 (Switcher)	06/02/2021	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/18/2021	12
RE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	03/09/2021	12
RE	KBA-05	141198	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+BBA9106	2513	04/10/2021	12
RE	MLA-20	141264	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	189	04/10/2021	12
RE	MAT-08	141213	Attenuator(6dB)	Weinschel Corp	2	BK7971	11/13/2020	12
RE	MCC-02	141350	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	06/02/2021	12
RE	MPA-19	141585	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	02/18/2021	12
RE	MSA-13	141900	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46185823	09/30/2021	12
RE	MOS-14	141561	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1401	01/15/2021	12
RE	MMM-18	141558	Digital Tester(TRUE RMS MULTIMETER)	Fluke Corporation	115	17930030	05/24/2021	12
RE	MJM-24	142225	Measure	ASKUL	-	-	-	-
FT	MSA-13	141900	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46185823	09/30/2021	12
FT	MLPA-08	202511	Loop Antenna	UL Japan	-	-	-	-
FT	MOS-14	141561	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1401	01/15/2021	12
FT	MMM-18	141558	Digital Tester(TRUE RMS MULTIMETER)	Fluke Corporation	115	17930030	05/24/2021	12
FT	MCH-04	141429	Temperature and Humidity Chamber	Espec	PL-2KP	14015723	08/05/2021	12

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

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

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

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

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

Test item:

CE: Conducted Emission

RE: Radiated Emission

FT: Frequency Tolerance