



EMI TEST REPORT

Test Report No. : 12475916H-A-R2

Applicant : RICOH COMPANY, LTD.
Type of Equipment : Digital Camera
Model No. : R02070
Test regulation : FCC Part 15 Subpart C: 2019
FCC ID : BBP-R02070
Test Result : Complied (Refer to SECTION 3.2)

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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 12475916H-A-R1. 12475916H-A-R1 is replaced with this report.

Date of test: October 7 to November 18, 2018

Representative test engineer:


Yuta Moriya
Engineer
Consumer Technology Division

Approved by:


Satofumi Matsuyama
Engineer
Consumer Technology Division



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://japan.ul.com/resources/emc_accredited/

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ 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.: 12475916H-A

[illegible]

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.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	6
SECTION 4: Operation of E.U.T. 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.....	20
Spurious emission	24
20dB Bandwidth and 99% Occupied Bandwidth.....	26
Frequency Tolerance.....	27
APPENDIX 2: Test instruments	28
APPENDIX 3: Photographs of test setup	29
Conducted Emission	29
Radiated Emission.....	30
Worst Case Position	31
With/Without Tag	32

SECTION 1: Customer information

Company Name	:	RICOH COMPANY, LTD.
Address	:	2-7-1 Izumi, Ebina, Kanagawa, 243-0460 Japan
Telephone Number	:	+81-46-249-8146
Facsimile Number	:	+81-3-6673-4430
Contact Person	:	Naohito Yazaki

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No. 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 (E.U.T.)
- SECTION 4: Operation of E.U.T. 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 (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Digital Camera
Model No.	:	R02070
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 3.6 V (Battery)
Receipt Date of Sample (Information from test lab.)	:	October 2, 2018
Country of Mass-production	:	Indonesia
Condition of EUT	:	Production 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

Model: R02070 (referred to as the EUT in this report) is a Digital Camera.

Operating Temperature: -10 deg. C to +40 deg. C

Radio Specification

WLAN (2.4 GHz band)

Type of radio	IEEE802.11b	IEEE802.11g	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Radio type	Transceiver			
Frequency of operation	2412 MHz - 2462 MHz			2422 MHz - 2452 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel spacing	5 MHz			
Antenna type	Chip Antenna			
Antenna Gain	+0.6 dBi			

WLAN (5 GHz band)

Type of radio	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11ac (20 M band)	IEEE802.11n (40 M band)	IEEE802.11ac (40 M band)	IEEE802.11ac (80 M band)
Radio type	Transceiver					
Frequency of operation	5180 MHz - 5240 MHz			5190 MHz - 5230 MHz		5210 MHz
Type of modulation	OFDM (64QAM, 16QAM, QPSK)		OFDM (256QAM, 64QAM, 16QAM, QPSK)	OFDM (64QAM, 16QAM, QPSK)	OFDM (256QAM, 64QAM, 16QAM, QPSK)	
Channel spacing	20 MHz			40 MHz		80 MHz
Antenna type	Chip Antenna					
Antenna Gain	+1.8 dBi					

Bluetooth

Type of radio	Bluetooth Ver.4.2
Radio type	Transceiver
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK): BDR/EDR GFSK: BLE
Channel spacing	1 MHz: BDR/EDR 2 MHz: BLE
Antenna type	Chip Antenna
Antenna Gain	+0.6 dBi

NFC *1)

Type of radio	NFC
Radio type	Transceiver
Frequency of operation	13.56 MHz
Type of modulation	ASK
Channel spacing	-
Antenna type	Pattern Antenna
Antenna Gain	-

*1) This test report applies to NFC.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on June 4, 2019 and effective July 5, 2019 except 15.258

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.

* The revision on June 4, 2019, does not affect the test specification applied to the EUT.

** The customer has declared that the EUT has complies with FCC Part 15 Subpart B as SDoC.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.10:2013 6 Standard test methods ----- <IC>RSS-Gen 8.8	Section 15.207 ----- <IC>RSS-Gen 8.8	[QP] 3.2 dB 0.19907 MHz, L [AV] 9.9 dB 0.19907 MHz, L	Complied# a)	-
Electric Field Strength of Fundamental Emission	ANSI C63.10:2013 6 Standard test methods ----- <IC> RSS-Gen 6.4, 6.12	Section 15.225(a) ----- <IC>RSS-210 B.6	66.6 dB, 13.56000 MHz, QP, 0 deg.	Complied b)	Radiated
Spectrum Mask	ANSI C63.10:2013 6 Standard test methods ----- <IC>RSS-Gen 6.4, 6.13	Section 15.225(b)(c) ----- <IC> RSS-210 B.6	45.5 dB, 14.01000 MHz, QP, 0 deg.	Complied b)	Radiated
20dB Bandwidth	ANSI C63.10:2013 6 Standard test methods ----- <IC> -	Section15.215(c) ----- <IC> -	See data	Complied c)	Radiated
Electric Field Strength of Spurious Emission	ANSI C63.10:2013 6 Standard test methods ----- <IC>RSS-Gen 6.4, 6.13	Section 15.209, Section 15.225 (d) ----- <IC>RSS-210 B.6	2.4 dB 296.998 MHz, Horizontal, QP	Complied# d)	Radiated
Frequency Tolerance	ANSI C63.10:2013 6 Standard test methods ----- <IC>RSS-Gen 6.11, 8.11	Section 15.225(e) ----- <IC> 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 20dB 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.

FCC Part 15.31 (e)

This EUT provides stable voltage constantly to RF Module through the regulator 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.

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

3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99 % Occupied Band Width	RSS-Gen 6.6	-	Radiated	N/A	N/A	Complied a)

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422

a) Refer to APPENDIX 1 (data of 20dB 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.

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

3.4 Uncertainty

EMI

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 $k = 2$.

Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.15 MHz to 30 MHz	3.4 dB

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
		5.0 dB
	200 MHz to 1000 MHz (Horizontal)	5.2 dB
		6.3 dB
10 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
		4.9 dB
	200 MHz to 1000 MHz (Horizontal)	5.0 dB
		5.0 dB
3 m	1 GHz to 6 GHz	5.0 dB
	6 GHz to 18 GHz	5.3 dB
1 m	10 GHz to 26.5 GHz	5.8 dB
	26.5 GHz to 40 GHz	5.8 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
Frequency Tolerance	0.0154 ppm (13.56 MHz) 0.0139 ppm ($\leq$ 13.56 MHz)
20dB Bandwidth / 99 % Occupied Bandwidth	0.96 %

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

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

*NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

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.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.

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 E.U.T. during testing

4.1 Operating Mode(s)

The mode is used :

Mode	Remarks*
Transmitting mode (Tx)	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. The EUT Transmits and Receives at the same time and there is no receiving mode.	

Test Item	Operating mode
Conducted emission	Tx Mod on, with Tag (FeliCa, Tagit Plus, Mifare) Tx Mod on, without Tag Tx Mod on, Antenna Terminated
Electric Field Strength of Fundamental Emission	Tx Mod on, with Tag (FeliCa, Tagit Plus, Mifare) Tx Mod on, without Tag
Spectrum Mask	Tx Mod on, with Tag (FeliCa, Tagit Plus, Mifare) Tx Mod on, without Tag
20 dB Bandwidth	Tx Mod on, with Tag (FeliCa) *1)
99 % Occupied Bandwidth	Tx Mod on, without Tag
Spurious Emission	Tx Mod on, with Tag (FeliCa) *2)
Frequency Tolerance	Tx Mod off

*1) After the comparison of the Electric Field Strength of Fundamental Emission test data with Tag (FeliCa, Tagit Plus, Mifare), the test was performed with the worst case..

*2) After the comparison of the Electric Field Strength of Fundamental Emission test data, the test was performed with the worst case.

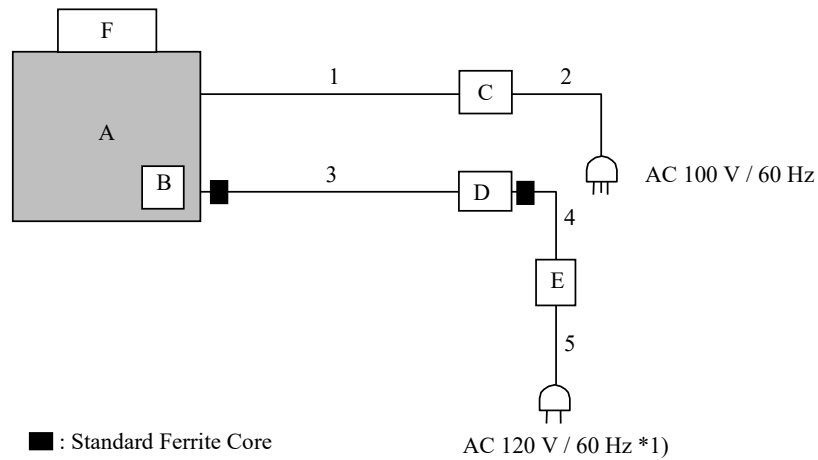
Justification: The system was configured in typical fashion (as a user would normally use it) for testing.

Frequency Tolerance:

Temperature : -20 deg. C to +50 deg. C Step 10 deg. C
Voltage : Normal Voltage DC 3.6 V
Maximum Voltage DC 4.14 V,
Minimum Voltage DC 3.06 V (DC 3.6 V $\pm$ 15 %)

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

4.2 Configuration and peripherals



*1) Conducted emission was performed on this port.

* 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	Digital Camera	R02070	017 (with/without Tag) 011 (Antenna Terminated)	RICOH COMPANY, LTD.	EUT
B	LI-ION Battery Pack	DB-110	20170328WAB	RICOH COMPANY, LTD.	-
C	Monitor	M237WS-PM	107KC8020445	LG	-
D	Laptop PC	CF-N8HWCDPS	9LKSA04258	Panasonic	-
E	AC Adapter	CF-AA6372B	6372BM409X14190B	Panasonic	-
F	FeliCa Tag	FeliCaLite-S	3	E-Garde co., LTD	-
	Tagit Plus Tag	Tag-it Plus	3	E-Garde co., LTD	-
	Mifare Tag	MIFARE DESFire 2k	3	E-Garde co., LTD	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	HDMI Cable	1.0	Shielded	Shielded	-
2	AC Cable	2.0	Unshielded	Unshielded	-
3	USB Cable	1.0	Shielded	Shielded	*1)
4	DC cable	1.0	Unshielded	Unshielded	-
5	AC cable	1.0	Unshielded	Unshielded	-

*1) This Cable was accessory of the EUT. This is only used to the EUT.

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, 1.0 m by 1.5 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.

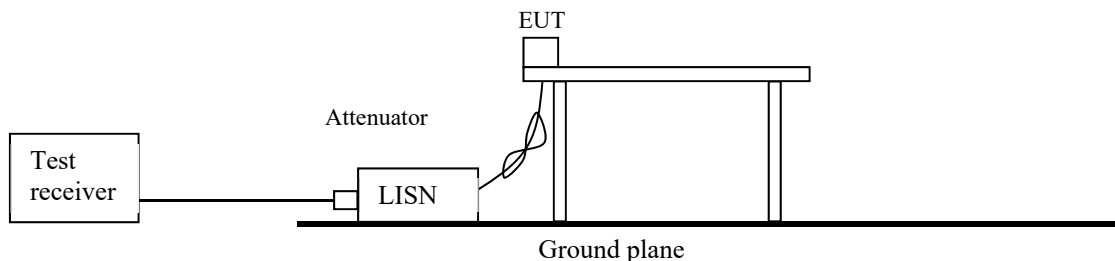
The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

Figure 1: Test Setup



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

Test Procedure

[For below 1GHz]

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

[For above 1GHz]

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

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

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.) 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.

For above 1 GHz, test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The 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.

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

Facsimile : +81 596 24 8124

SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	Between 2.0 times and 5.0 times of the OBW	10 kHz	30 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Between 1.5 times and 5.0 times of the OBW	10 kHz	30 kHz	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter
*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.							

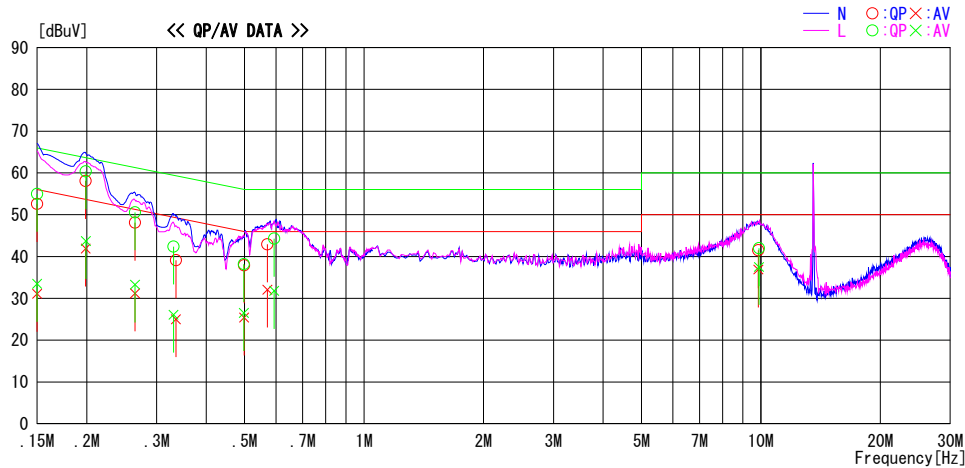
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date November 18, 2018
Temperature / Humidity 21 deg. C / 41 % RH
Engineer Yuta Moriya
Mode Tx Mod on, without Tag

LIMIT : FCC15. 207 QP
FCC15. 207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase
	QP	AV		QP	AV	QP	AV	QP	AV	
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]	
0.15000	39.1	17.6	13.5	52.6	31.1	66.0	56.0	13.4	24.9	N
0.15000	41.5	20.0	13.5	55.0	33.5	66.0	56.0	11.0	22.5	L
0.19883	44.6	28.4	13.5	58.1	41.9	63.7	53.7	5.6	11.8	N
0.19907	46.9	30.2	13.5	60.4	43.7	63.6	53.6	3.2	9.9	L
0.26474	37.1	19.8	13.5	50.6	33.3	61.3	51.3	10.7	18.0	L
0.26482	34.6	17.7	13.5	48.1	31.2	61.3	51.3	13.2	20.1	N
0.33108	28.9	12.6	13.5	42.4	26.1	59.4	49.4	17.0	23.3	L
0.33563	25.6	11.5	13.5	39.1	25.0	59.3	49.3	20.2	24.3	N
0.49786	24.7	13.0	13.5	38.2	26.5	56.0	46.0	17.8	19.5	L
0.49828	24.4	11.9	13.5	37.9	25.4	56.0	46.0	18.1	20.6	N
0.57066	29.4	18.6	13.5	42.9	32.1	56.0	46.0	13.1	13.9	N
0.59359	30.7	18.2	13.6	44.3	31.8	56.0	46.0	11.7	14.2	L
9.85118	27.3	22.7	14.2	41.5	36.9	60.0	50.0	18.5	13.1	N
9.89044	27.8	23.3	14.2	42.0	37.5	60.0	50.0	18.0	12.5	L

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + 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

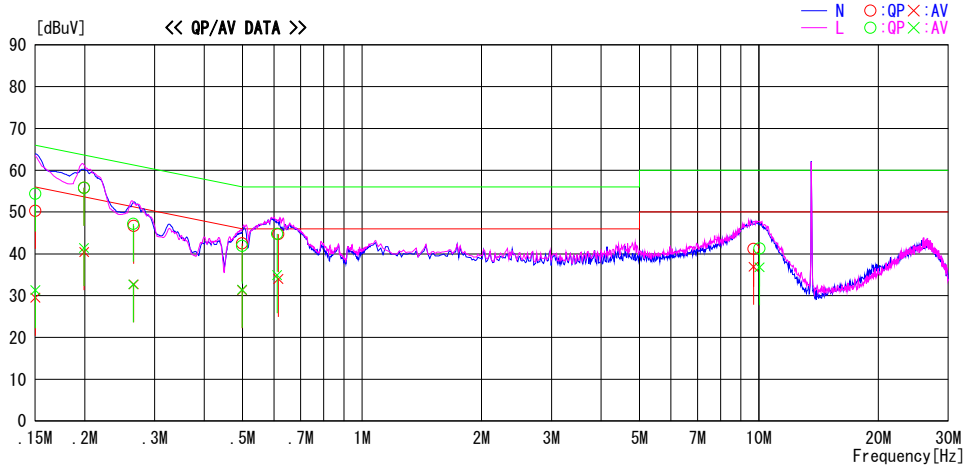
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date November 18, 2018
Temperature / Humidity 21 deg. C / 41 % RH
Engineer Yuta Moriya
Mode Tx Mod on, with Tag (FeliCa)

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15013	36.8	16.0	13.5	50.3	29.5	66.0	56.0	15.7	26.5	N
0.15025	40.9	17.8	13.5	54.4	31.3	66.0	56.0	11.6	24.7	L
0.19922	42.3	27.9	13.5	55.8	41.4	63.6	53.6	7.8	12.2	L
0.19941	42.3	26.9	13.5	55.8	40.4	63.6	53.6	7.8	13.2	N
0.26498	33.7	19.2	13.5	47.2	32.7	61.3	51.3	14.1	18.6	L
0.26570	33.2	19.2	13.5	46.7	32.7	61.3	51.3	14.6	18.6	N
0.49828	28.4	17.9	13.5	41.9	31.4	56.0	46.0	14.1	14.6	L
0.49838	29.0	17.8	13.5	42.5	31.3	56.0	46.0	13.5	14.7	N
0.61079	31.2	21.3	13.6	44.8	34.9	56.0	46.0	11.2	11.1	L
0.61498	31.1	20.4	13.6	44.7	34.0	56.0	46.0	11.3	12.0	N
9.69021	27.0	22.7	14.2	41.2	36.9	60.0	50.0	18.8	13.1	N
10.03780	27.1	22.6	14.2	41.3	36.8	60.0	50.0	18.7	13.2	L

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + 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

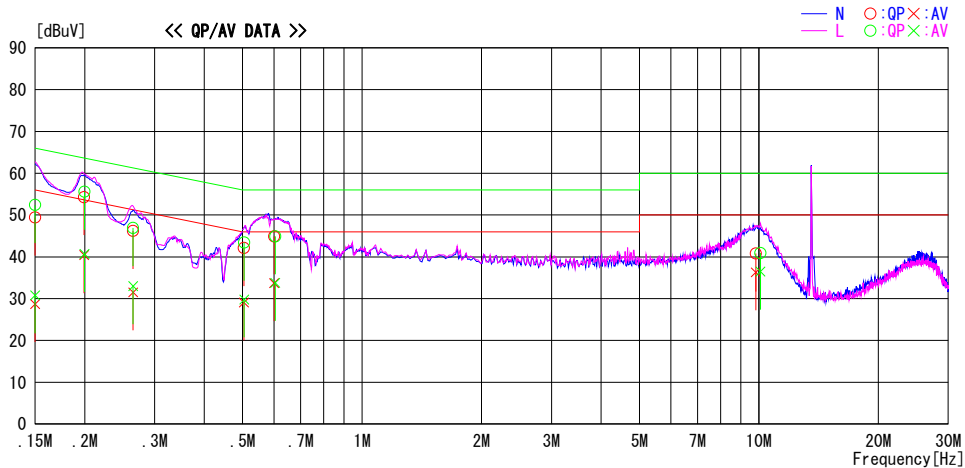
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date November 18, 2018
Temperature / Humidity 21 deg. C / 41 % RH
Engineer Yuta Moriya
Mode Tx Mod on, with Tag (Tagit Plus)

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15001	35.9	15.2	13.5	49.4	28.7	66.0	56.0	16.6	27.3	N
0.15001	38.9	17.3	13.5	52.4	30.8	66.0	56.0	13.6	25.2	L
0.19936	40.8	26.9	13.5	54.3	40.4	63.6	53.6	9.3	13.2	N
0.19970	42.1	27.2	13.5	55.6	40.7	63.6	53.6	8.0	12.9	L
0.26488	32.7	18.0	13.5	46.2	31.5	61.3	51.3	15.1	19.8	N
0.26494	33.4	19.5	13.5	46.9	33.0	61.3	51.3	14.4	18.3	L
0.50399	28.6	15.6	13.5	42.1	29.1	56.0	46.0	13.9	16.9	N
0.50475	29.9	16.3	13.5	43.4	29.8	56.0	46.0	12.6	16.2	L
0.60028	31.3	20.1	13.6	44.9	33.7	56.0	46.0	11.1	12.3	N
0.60434	31.3	20.2	13.6	44.9	33.8	56.0	46.0	11.1	12.2	L
9.81814	26.6	22.1	14.2	40.8	36.3	60.0	50.0	19.2	13.7	N
10.08380	26.7	22.3	14.2	40.9	36.5	60.0	50.0	19.1	13.5	L

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + 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

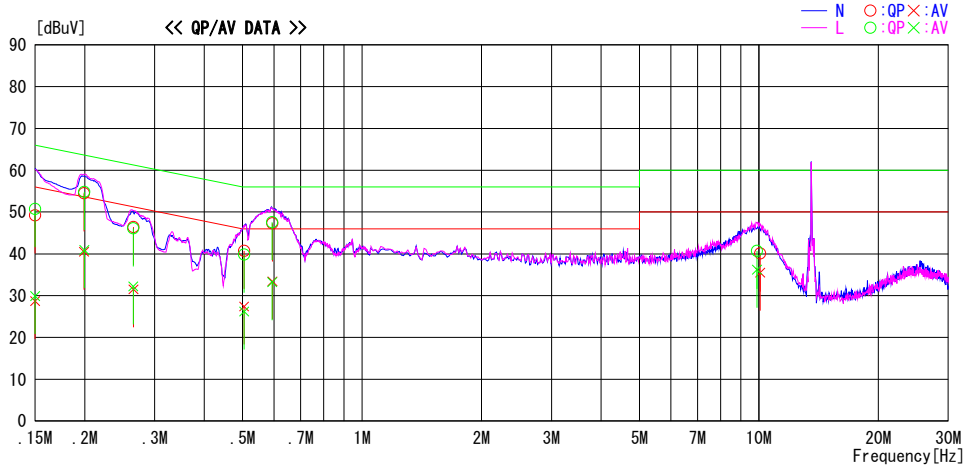
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date November 18, 2018
Temperature / Humidity 21 deg. C / 41 % RH
Engineer Yuta Moriya
Mode Tx Mod on, with Tag (Mifare)

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15001	35.7	15.2	13.5	49.2	28.7	66.0	56.0	16.8	27.3	N
0.15001	37.2	16.4	13.5	50.7	29.9	66.0	56.0	15.3	26.1	L
0.19928	41.0	27.0	13.5	54.5	40.5	63.6	53.6	9.1	13.1	N
0.19960	41.3	27.4	13.5	54.8	40.9	63.6	53.6	8.8	12.7	L
0.26524	32.6	18.7	13.5	46.1	32.2	61.3	51.3	15.2	19.1	L
0.26535	32.9	18.0	13.5	46.4	31.5	61.3	51.3	14.9	19.8	N
0.50413	27.2	13.9	13.5	40.7	27.4	56.0	46.0	15.3	18.6	N
0.50452	26.3	12.7	13.5	39.8	26.2	56.0	46.0	16.2	19.8	L
0.59357	34.0	19.6	13.6	47.6	33.2	56.0	46.0	8.4	12.8	L
0.59453	33.7	19.8	13.6	47.3	33.4	56.0	46.0	8.7	12.6	N
9.88780	26.5	22.0	14.2	40.7	36.2	60.0	50.0	19.3	13.8	L
10.07390	25.9	21.3	14.2	40.1	35.5	60.0	50.0	19.9	14.5	N

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + 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

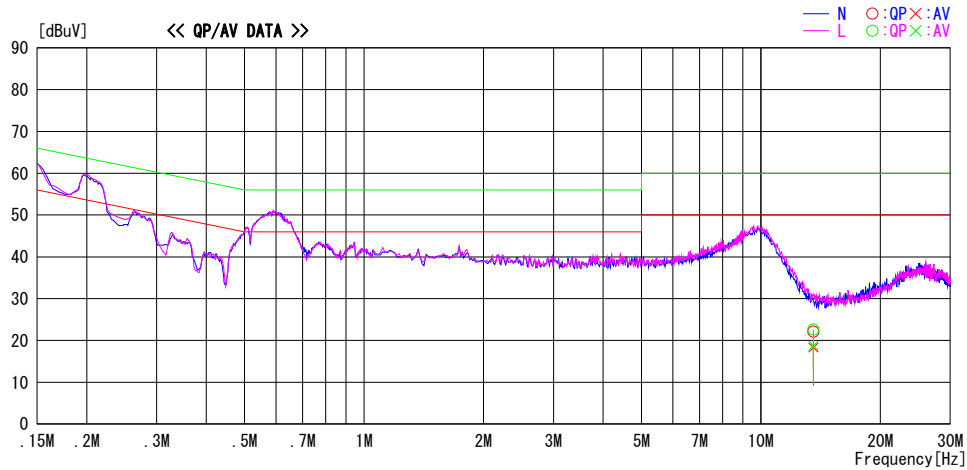
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date November 18, 2018
Temperature / Humidity 21 deg. C / 41 % RH
Engineer Yuta Moriya
Mode Tx Mod on, Antenna Terminated

LIMIT : FCC15. 207 QP
FCC15. 207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
13.56000	7.8	4.0	14.3	22.1	18.3	60.0	50.0	37.9	31.7	N
13.56000	8.3	4.4	14.3	22.6	18.7	60.0	50.0	37.4	31.3	L

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + C.F (LISN + 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

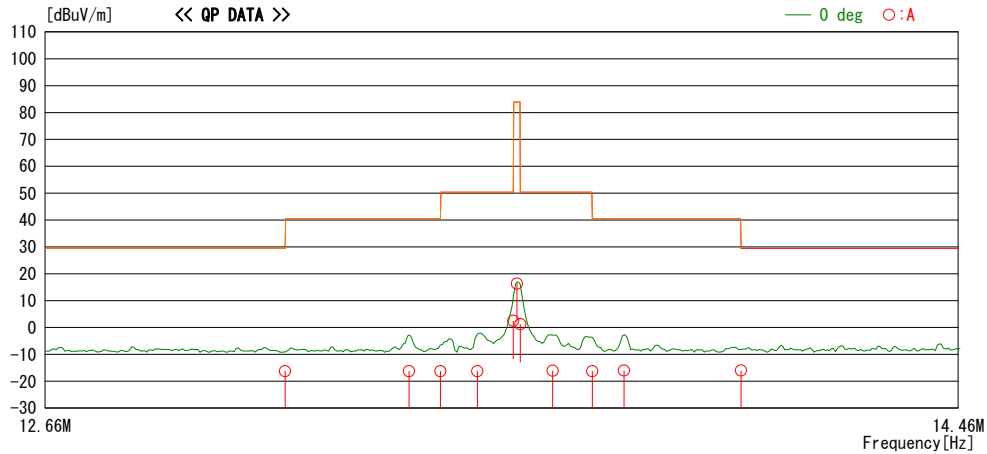
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Fundamental emission and Spectrum Mask

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 07, 2018
Temperature / Humidity 24 deg. C / 48 % RH
Engineer Hiroyuki Furutaka
Mode Tx Mod on, without Tag

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	29.3	QP	19.6	-33.1	32.1	-16.3	29.5	45.8	0	A	252
13.34900	29.4	QP	19.6	-33.1	32.1	-16.2	40.5	56.7	0	A	252
13.41000	29.3	QP	19.6	-33.1	32.1	-16.3	40.5	56.8	0	A	252
13.48200	29.3	QP	19.7	-33.1	32.1	-16.2	50.4	66.6	0	A	252
13.55300	48.0	QP	19.7	-33.1	32.1	2.5	50.4	47.9	0	A	252
13.56000	61.8	QP	19.7	-33.1	32.1	16.3	83.9	67.6	0	A	252
13.56700	46.7	QP	19.7	-33.1	32.1	1.2	50.4	49.2	0	A	252
13.63100	29.4	QP	19.7	-33.1	32.1	-16.1	50.4	66.5	0	A	252
13.71000	29.3	QP	19.7	-33.1	32.1	-16.2	40.5	56.7	0	A	252
13.77319	29.5	QP	19.7	-33.1	32.1	-16.0	40.5	56.5	0	A	252
14.01000	29.5	QP	19.7	-33.1	32.1	-16.0	29.5	45.5	0	A	252

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

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	61.8	19.7	6.9	32.1	-	56.3	-	-	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

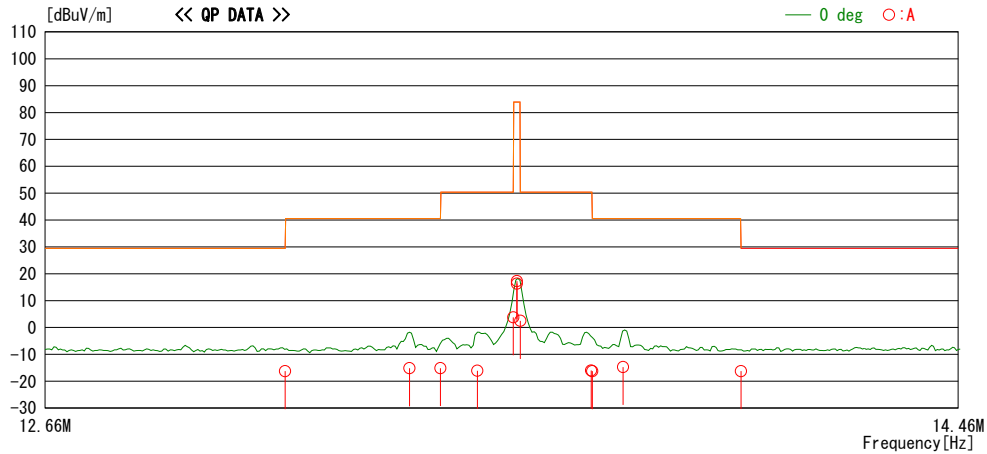
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Fundamental emission and Spectrum Mask

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 07, 2018
Temperature / Humidity 24 deg. C / 48 % RH
Engineer Hiroyuki Furutaka
Mode Tx Mod on, with Tag (FeliCa)

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	29.3	QP	19.6	-33.1	32.1	-16.3	29.5	45.8	0	A	252
13.34980	30.4	QP	19.6	-33.1	32.1	-15.2	40.5	55.7	0	A	252
13.41000	30.5	QP	19.6	-33.1	32.1	-15.1	40.5	55.6	0	A	252
13.48200	29.4	QP	19.7	-33.1	32.1	-16.1	50.4	66.5	0	A	252
13.55300	49.3	QP	19.7	-33.1	32.1	3.8	50.4	46.6	0	A	252
13.56000	62.8	QP	19.7	-33.1	32.1	17.3	83.9	66.6	0	A	252
13.56000	61.8	QP	19.7	-33.1	32.1	16.3	83.9	67.6	0	A	252 without Tag
13.56700	48.0	QP	19.7	-33.1	32.1	2.5	50.4	47.9	0	A	252
13.70758	29.5	QP	19.7	-33.1	32.1	-16.0	50.4	66.4	0	A	252
13.71000	29.2	QP	19.7	-33.1	32.1	-16.3	40.5	56.8	0	A	252
13.77120	30.8	QP	19.7	-33.1	32.1	-14.7	40.5	55.2	0	A	252
14.01000	29.3	QP	19.7	-33.1	32.1	-16.2	29.5	45.7	0	A	252

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

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	62.8	19.7	6.9	32.1	-	57.3	-	-	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

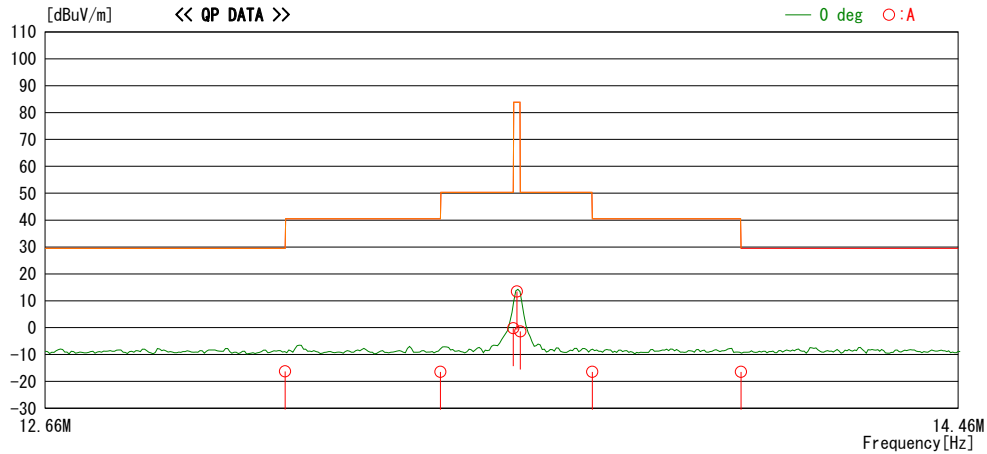
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Fundamental emission and Spectrum Mask

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 07, 2018
Temperature / Humidity 24 deg. C / 48 % RH
Engineer Hiroyuki Furutaka
Mode Tx Mod on, with Tag (Tagit Plus)

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	29.3	QP	19.6	-33.1	32.1	-16.3	29.5	45.8	0	A	252
13.41000	29.2	QP	19.6	-33.1	32.1	-16.4	40.5	56.9	0	A	252
13.55300	45.3	QP	19.7	-33.1	32.1	-0.2	50.4	50.6	0	A	252
13.56000	58.9	QP	19.7	-33.1	32.1	13.4	83.9	70.5	0	A	252
13.56700	44.1	QP	19.7	-33.1	32.1	-1.4	50.4	51.8	0	A	252
13.71000	29.1	QP	19.7	-33.1	32.1	-16.4	40.5	56.9	0	A	252
14.01000	29.1	QP	19.7	-33.1	32.1	-16.4	29.5	45.9	0	A	252

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

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	58.9	19.7	6.9	32.1	-	53.4	-	-	- 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

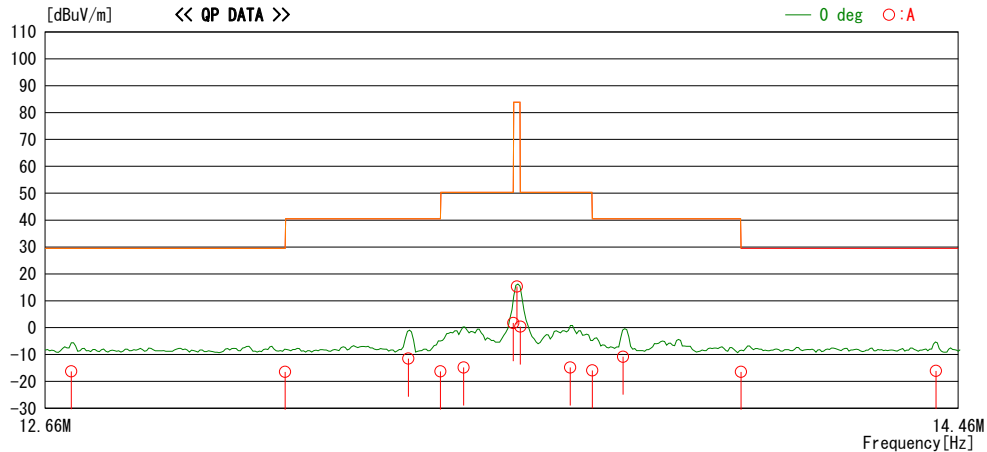
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Fundamental emission and Spectrum Mask

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 07, 2018
Temperature / Humidity 24 deg. C / 48 % RH
Engineer Hiroyuki Furutaka
Mode Tx Mod on, with Tag (Mifare)

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
12.70831	29.4	QP	19.6	-33.1	32.1	-16.2	29.5	45.7	0	A	252
13.11000	29.2	QP	19.6	-33.1	32.1	-16.4	29.5	45.9	0	A	252
13.34741	34.1	QP	19.6	-33.1	32.1	-11.5	40.5	52.0	0	A	252
13.41000	29.3	QP	19.6	-33.1	32.1	-16.3	40.5	56.8	0	A	252
13.45540	30.7	QP	19.7	-33.1	32.1	-14.8	50.4	65.2	0	A	252
13.55300	47.2	QP	19.7	-33.1	32.1	1.7	50.4	48.7	0	A	252
13.56000	60.8	QP	19.7	-33.1	32.1	15.3	83.9	68.6	0	A	252
13.56700	45.9	QP	19.7	-33.1	32.1	0.4	50.4	50.0	0	A	252
13.66582	30.7	QP	19.7	-33.1	32.1	-14.8	50.4	65.2	0	A	252
13.71000	29.6	QP	19.7	-33.1	32.1	-15.9	40.5	56.4	0	A	252
13.77120	34.7	QP	19.7	-33.1	32.1	-10.8	40.5	51.3	0	A	252
14.01000	29.1	QP	19.7	-33.1	32.1	-16.4	29.5	45.9	0	A	252
14.41300	29.3	QP	19.8	-33.1	32.1	-16.1	29.5	45.6	0	A	252

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

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	60.8	19.7	6.9	32.1	-	55.3	-	-	- 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

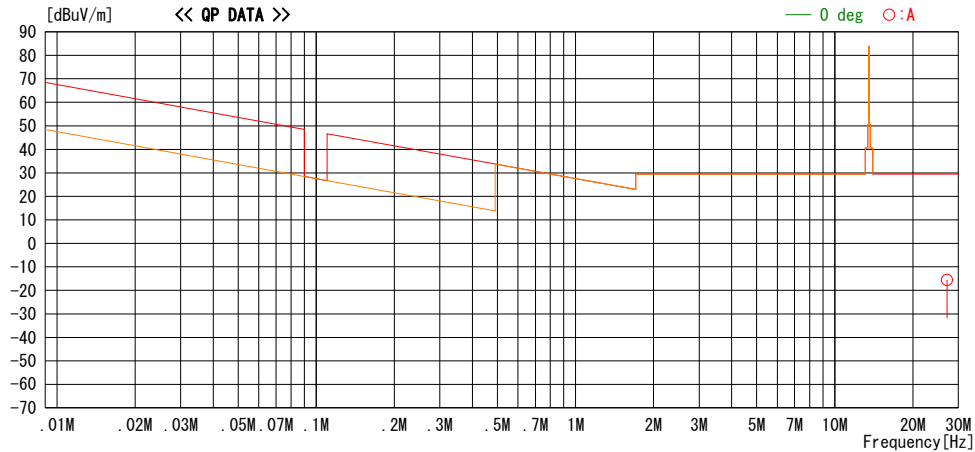
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Spurious emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 07, 2018
Temperature / Humidity 24 deg. C / 48 % RH
Engineer Hiroyuki Furutaka
Mode Tx Mod on, with Tag (FeliCa)

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15_225_AVQP, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	29.0	QP	20.3	-32.8	32.1	-15.6	29.5	45.1	0	A	359

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC,
1000 MHz -: HORN

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

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

UL Japan, Inc.

Ise EMC Lab.

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

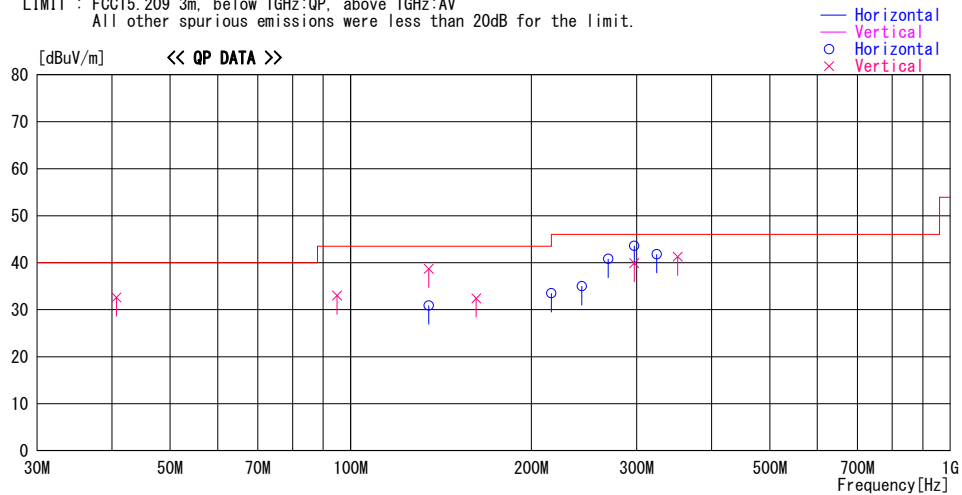
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Spurious emission

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date October 07, 2018
Temperature / Humidity 24 deg. C / 48 % RH
Engineer Hiroyuki Furutaka
Mode Tx Mod on, with Tag (FeliCa)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:AV
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
40.679	42.9	QP	14.4	-24.7	32.6	134	100	Vert.	40.0	7.4	
94.916	47.6	QP	9.3	-23.9	33.0	114	100	Vert.	43.5	10.5	
135.000	48.1	QP	14.1	-23.5	38.7	200	100	Vert.	43.5	4.8	
135.000	40.3	QP	14.1	-23.5	30.9	226	132	Hori.	43.5	12.6	
161.998	39.9	QP	15.6	-23.1	32.4	359	100	Vert.	43.5	11.1	
216.000	45.1	QP	11.1	-22.7	33.5	160	100	Hori.	43.5	10.0	
242.994	45.9	QP	11.6	-22.5	35.0	176	119	Hori.	46.0	11.0	
268.938	50.4	QP	12.7	-22.3	40.8	163	116	Hori.	46.0	5.2	
296.998	52.2	QP	13.5	-22.1	43.6	317	100	Hori.	46.0	2.4	
296.998	48.5	QP	13.5	-22.1	39.9	347	100	Vert.	46.0	6.1	
323.998	49.4	QP	14.3	-21.9	41.8	326	100	Hori.	46.0	4.2	
350.998	48.0	QP	15.0	-21.7	41.3	58	100	Vert.	46.0	4.7	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC,
1000 MHz -: HORN

CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE + ATT - GAIN(AMP))

UL Japan, Inc.

Ise EMC Lab.

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

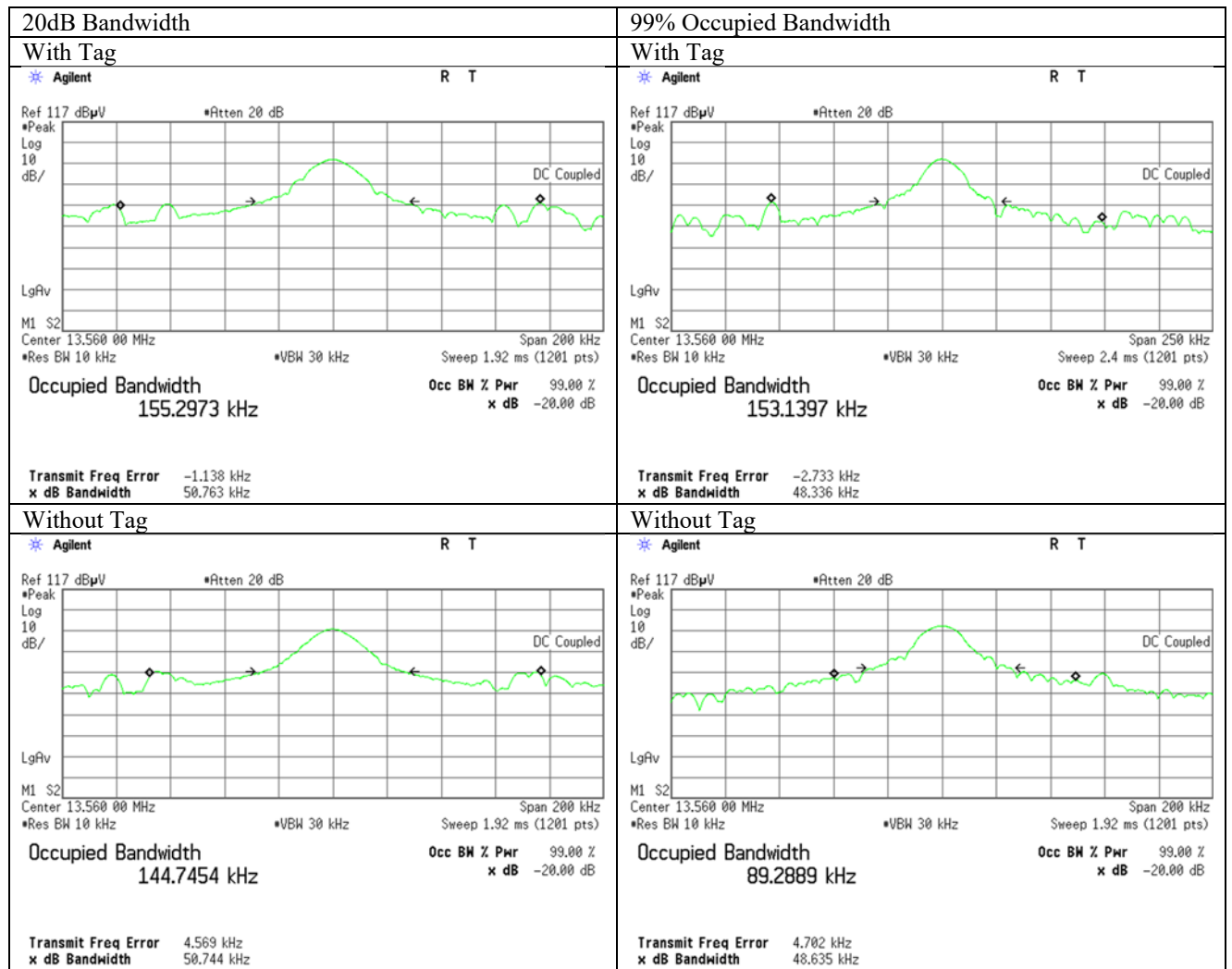
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

20dB Bandwidth and 99% Occupied Bandwidth

Report No. 12475916H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.11
Date October 9, 2018
Temperature / Humidity 22 deg. C / 57 % RH
Engineer Tomoki Matsui
Mode Tx Mod on with Tag (FeliCa)
Tx Mod on without Tag

FREQ [MHz]	with/without Tag	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	with Tag (FeliCa)	50.763	153.140
	without Tag	50.744	89.289



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

Frequency Tolerance

Report No.	12475916H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.11
Date	October 9, 2018
Temperature / Humidity	22 deg. C / 57 % RH
Engineer	Tomoki Matsui
Mode	Tx Mod off

Test condition		Tested timing	Measured frequency [MHz]	Frequency error [MHz]	Result		Limit
Temp. [deg. C]	Voltage [V]				[%]	[ppm]	
50	3.6	Power on	13.559793	-0.000207	-0.00153	-15.3	0.01
		+ 2 min.	13.559787	-0.000213	-0.00157	-15.7	0.01
		+ 5 min.	13.559787	-0.000213	-0.00157	-15.7	0.01
		+ 10 min.	13.559792	-0.000208	-0.00153	-15.3	0.01
40	3.6	Power on	13.559802	-0.000198	-0.00146	-14.6	0.01
		+ 2 min.	13.559793	-0.000207	-0.00153	-15.3	0.01
		+ 5 min.	13.559792	-0.000208	-0.00153	-15.3	0.01
		+ 10 min.	13.559791	-0.000209	-0.00154	-15.4	0.01
30	3.6	Power on	13.559817	-0.000183	-0.00135	-13.5	0.01
		+ 2 min.	13.559805	-0.000195	-0.00144	-14.4	0.01
		+ 5 min.	13.559803	-0.000197	-0.00145	-14.5	0.01
		+ 10 min.	13.559802	-0.000198	-0.00146	-14.6	0.01
20	3.6	Power on	13.559818	-0.000182	-0.00134	-13.4	0.01
		+ 2 min.	13.559816	-0.000184	-0.00136	-13.6	0.01
		+ 5 min.	13.559814	-0.000186	-0.00137	-13.7	0.01
		+ 10 min.	13.559813	-0.000187	-0.00138	-13.8	0.01
20	3.06 (3.6 V -15 %)	Power on	13.559841	-0.000159	-0.00117	-11.7	0.01
		+ 2 min.	13.559829	-0.000171	-0.00126	-12.6	0.01
		+ 5 min.	13.559824	-0.000176	-0.00130	-13.0	0.01
		+ 10 min.	13.559821	-0.000179	-0.00132	-13.2	0.01
20	4.14 (3.6 V +15 %)	Power on	13.559825	-0.000175	-0.00129	-12.9	0.01
		+ 2 min.	13.559819	-0.000181	-0.00133	-13.3	0.01
		+ 5 min.	13.559817	-0.000183	-0.00135	-13.5	0.01
		+ 10 min.	13.559815	-0.000185	-0.00136	-13.6	0.01
10	3.6	Power on	13.559864	-0.000136	-0.00100	-10.0	0.01
		+ 2 min.	13.559850	-0.000150	-0.00111	-11.1	0.01
		+ 5 min.	13.559849	-0.000151	-0.00111	-11.1	0.01
		+ 10 min.	13.559850	-0.000150	-0.00111	-11.1	0.01
0	3.6	Power on	13.559892	-0.000108	-0.00080	-8.0	0.01
		+ 2 min.	13.559881	-0.000119	-0.00088	-8.8	0.01
		+ 5 min.	13.559882	-0.000118	-0.00087	-8.7	0.01
		+ 10 min.	13.559884	-0.000116	-0.00086	-8.6	0.01
-10	3.6	Power on	13.559899	-0.000101	-0.00074	-7.4	0.01
		+ 2 min.	13.559900	-0.000100	-0.00074	-7.4	0.01
		+ 5 min.	13.559899	-0.000101	-0.00074	-7.4	0.01
		+ 10 min.	13.559899	-0.000101	-0.00074	-7.4	0.01
-20	3.6	Power on	13.559867	-0.000133	-0.00098	-9.8	0.01
		+ 2 min.	13.559892	-0.000108	-0.00080	-8.0	0.01
		+ 5 min.	13.559893	-0.000107	-0.00079	-7.9	0.01
		+ 10 min.	13.559893	-0.000107	-0.00079	-7.9	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.

APPENDIX 2: Test instruments

Test Instruments

Test Name	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/03/2018	10/31/2019	12
CE, RE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/28/2018	06/30/2020	24
CE, RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	01/30/2018	01/31/2019	12
CE, RE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	01/09/2018	01/31/2019	12
CE, RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	142152	Loop Antenna	Rohde & Schwarz	HFH2-Z2	836553/009	11/22/2017	11/30/2018	12
CE, RE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	11/5/1900	260833	02/27/2018	02/28/2019	12
RE	159670	Coaxial Cable	UL Japan Inc.	-	-	11/07/2018	11/30/2019	12
CE	141935	Terminator	TME	CT-01BP	-	12/11/2017	12/31/2018	12
CE	141358	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	07/25/2018	07/31/2019	12
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	07/24/2018	07/31/2019	12
CE, RE	141217	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM141/421-010/sucoform141-P	-/04178	06/13/2018	06/30/2019	12
CE	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/19/2017	12/31/2018	12
RE	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	06/01/2018	06/30/2019	12
RE	141425	Biconical Antenna	Schwarzbeck	BBA9106	1302	06/01/2018	06/30/2019	12
CE, RE	141562	Thermo-Hygrometer	CUSTOM	CTH-180	1501	01/24/2018	01/31/2019	12
FT	141275	Barometer	Sunoh	SBR121	873	02/08/2018	02/28/2021	36
FT	141498	Microwave Counter	ADVANTEST	R5373	120100309	06/28/2018	06/30/2019	12
FT	141567	Thermo-Hygrometer	CUSTOM	CTH-201	0008	01/24/2018	01/31/2019	12
FT	141547	DIGITAL HiTESTER	HIOKI	3805	60500120	02/07/2018	02/28/2019	12
FT	141440	Temperature and Humidity Chamber	TABAI ESPEC	PL-1KP	14019569	04/10/2018	04/29/2019	12

*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int 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.

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

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

Test item:

CE: Conducted Emission

RE: Radiated Emission

FT: Frequency Tolerance

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