



RADIO TEST REPORT

Test Report No.: 11516564S-A-R4

Applicant : FUJIFILM Corporation
Type of Equipment : NFC Reader/Writer Module
Model No. : ICM-3200T-M
FCC ID : W2Z-03000004
Test regulation : FCC Part 15 Subpart C: 2016
Test result : Complied

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 any agency of the Federal Government.
6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
7. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
8. This report is a revised version of 11516564S-A-R3. 11516564S-A-R3 is replaced with this report.

Date of test:

December 7 to 13, 2016

Representative test engineer:

Yosuke Ishikawa
Engineer

Consumer Technology Division

Approved by :

Akio Hayashi
Leader

Consumer Technology Division



- ☐ 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.
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

13-EM-F0429

Original Test Report No.: 11516564S-A

[illegible]

Facsimile : +81 463 50 6401

Contents

	<u>Page</u>
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.)	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing.....	8
SECTION 5: Conducted emission	10
SECTION 6: Radiated emission (Fundamental and Spurious emission)	11
SECTION 7: 20dB bandwidth & Occupied bandwidth (99 %).....	13
SECTION 8: Frequency tolerances	13
APPENDIX 1: Data of Radio tests.....	14
APPENDIX 2: Test instruments	34
APPENDIX 3: Photographs of test setup.....	36

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 1: Customer information

Company Name : FUJIFILM Corporation
Address : 7-3, Akasaka 9-Chome, Minato-ku, Tokyo 107-0052 JAPAN
Telephone Number : +81-3-6271-3660
Facsimile Number : +81-3-6271-3159
Contact Person : Rokusaburo Kaneko

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : NFC Reader/Writer Module
Model No. : ICM-3200T-M
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 5.0 V
Receipt Date of Sample : December 6 and 7, 2016
Country of Mass-production : Japan
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: ICM-3200T-M (referred to as the EUT in this report) is a NFC Reader/Writer Module.

The clock frequencies used in the EUT : 27.12 MHz

Radio Specification

Equipment type : Transceiver
Frequency of operation : 13.56 MHz
Type of modulation : ASK
ITU code : A1D

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C
FCC Part 15 final revised on November 14, 2016 and effective December 14, 2016
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.215 Additional provisions to the general radiated emission limitations
Section 15.225 Operation within the band 13.110-14.010 MHz

* The revision on November 14, 2016, does not affect the test specification applied to the EUT.

The EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report 11516564S-C.

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2013 6 Standard test methods	FCC 15.207	-	N/A	5.2 dB Freq.: 27.12000 MHz Detection: AV Phase: L1 Mode: Communication with Card	Complied
	<IC>RSS-Gen 8.8	<IC> RSS-Gen 8.8				
Electric field strength of Fundamental emission	ANSI C63.10:2013 6 Standard test methods	FCC 15.225 (a)	Radiated	N/A	25.3 dB Polarization: Vertical Mode: Communication without Card	Complied
	<IC>RSS-Gen 6.4, 6.12	<IC> RSS-210 B.6				
Electric field strength of Spurious emission (within the 13.110-14.010 MHz band)	ANSI C63.10:2013 6 Standard test methods	FCC 15.225 (b)(c)	Radiated	N/A	29.9 dB Freq.: 13.553 MHz Polarization: Vertical Mode: Transmitting 13.56 MHz, Communication without Card	Complied
	<IC>RSS-Gen 6.4, 6.13	<IC> RSS-210 B.6				
Electric field strength of Spurious emission (outside of the 13.110-14.010 MHz band)	ANSI C63.10:2013 6 Standard test methods	FCC 15.209 FCC 15.225 (d)	Radiated	N/A	2.3 dB Freq.: 45.882 MHz Polarization: Vertical Mode: Communication without Card	Complied
	<IC>RSS-Gen 6.4, 6.13	<IC> RSS-210 B.6				
20dB bandwidth	ANSI C63.10:2013 6 Standard test methods	FCC 15.215 (c)	Radiated	N/A	-	-
	<IC> -	<IC> -				
Frequency tolerance	ANSI C63.10:2013 6 Standard test methods	FCC 15.225 (e)	Radiated	N/A	-	Complied
	<IC> RSS-Gen 6.11, 8.11	<IC> RSS-210 B.6				

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

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 1.8 V) constantly to RF part regardless of input voltage. Therefore, the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The antenna is not removable from the EUT. Therefore, the equipment complies with the requirement.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99 %)	RSS-Gen 6.6	-	Radiated	-	-
Note: UL Japan's 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

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

Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.5 dB	2.6 dB	2.5 dB	2.5 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.1 dB	3.1 dB	3.1 dB	-	-
	30 MHz-200 MHz	4.6 dB	4.4 dB	4.6 dB	-	-
	200 MHz-1 GHz	5.8 dB	5.7 dB	5.8 dB	-	-
	1 GHz-13 GHz	4.9 dB	4.9 dB	4.9 dB	-	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.6 dB	4.6 dB	4.6 dB	-	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.72 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.85 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.91 dB
Spurious emission (Conducted) below 1GHz	1.6 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.3 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.2 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.3 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.4 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

Conducted emission

The data listed in this test report has enough margin, more than site margin.

Radiated emission

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
JAB Accreditation No. RTL02610

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 1 to 3.

UL Japan, Inc. Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

SECTION 4: Operation of E.U.T. during testing

4.1 Operating mode

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Operating mode	Tested frequency
Frequency tolerance	Continuous wave	13.56 MHz
All items other than Frequency tolerance	Transmitting: EUT is transmitting continuously with ASK modulation. Communication with Card: EUT is communicating with tag (Card) continuously. Communication without Card: EUT is searching tag (Card) with ASK 10 % modulation.	13.56 MHz

Software: ICM-3200T TestTool Ver 0.2.2.0

Power settings: Fixed

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

UL Japan, Inc.

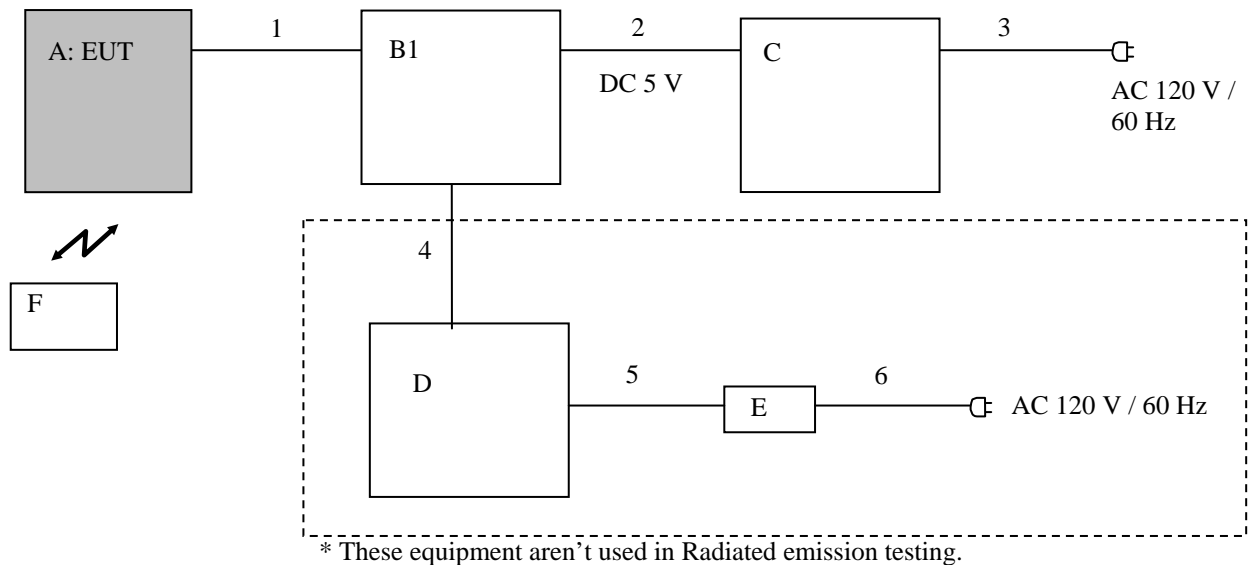
Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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	NFC Reader/Writer	ICM-3200T-M	R16300061A	FUJIFILM	EUT
B	JIG	-	-	FUJIFILM	-
C	DC Power Supply	PAN35-10A	NA000955	Kikusui	-
D	Note PC	PCG-5Q2N	VGN-G3AANS	SONY	-
E	AC Adapter	VGP-AC16V11	0907G	SONY	-
F	FeliCa Card	LMF-301-L-A1	150228-1	SONY	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal	0.5	Shielded	Shielded	-
2	DC	0.9	Unshielded	Unshielded	-
3	AC	1.9	Unshielded	Unshielded	-
4	Signal	1.5	Unshielded	Unshielded	-
5	DC	0.8	Unshielded	Unshielded	-
6	AC	1.8	Unshielded	Unshielded	-

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 5: Conducted emission

5.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

5.2 Test configuration

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of peripheral was aligned and was 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 LISN. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. Photographs of the set up are shown in APPENDIX 3.

5.3 Test conditions

Frequency range : 0.15 MHz - 30 MHz
EUT position : Table top

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT within a Shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, a CISPR average detector. The conducted emission measurements were made with the following detection of the test receiver.

Detection Type : Quasi-Peak/ CISPR Average
IF Bandwidth : 9 kHz

5.5 Results

Summary of the test results : Pass
Refer to APPENDIX 1

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 6: Radiated emission (Fundamental and Spurious emission)

6.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

6.2 Test configuration

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. Photographs of the set up are shown in Appendix 1.

6.3 Test conditions

Frequency range : 9 kHz - 1 GHz
Test distance : 3 m
EUT position : Table top

6.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane at a distance of 3 m.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area 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 937606. 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 Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3 m
Frequency: From 9 kHz to 30 MHz at distance 3 m

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.to 360 deg.) and horizontal polarization. Drawing of the antenna direction is shown in Figure 1.

Frequency: From 30 MHz to 1 GHz at distance 3 m (Refer to Figure 2).

The measuring antenna height was varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with QP, PK, and AV detector.

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

	9 kHz to 90 kHz & 110 kHz to 150 kHz	90 kHz to 110 kHz	150 kHz to 490 kHz	490 kHz to 30 MHz	30 MHz to 1 GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz
Measuring antenna	Loop antenna				Biconical (30 MHz-199.99 MHz) Logperiodic (200 MHz-1 GHz)

* FCC 15.31 (f)(2) (9 kHz-30 MHz)

9 kHz – 490 kHz [Limit at 3 m]= [Limit at 300 m]-40 log (3 [m]/300 [m])

490 kHz – 30 MHz [Limit at 3 m]= [Limit at 30 m]-40 log (3 [m]/30 [m])

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

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

6.5 Results

Summary of the test results : Pass
No spurious emissions exceeded the fundamental emission level.

Refer to APPENDIX 1.

Figure 1. Direction of the Loop Antenna

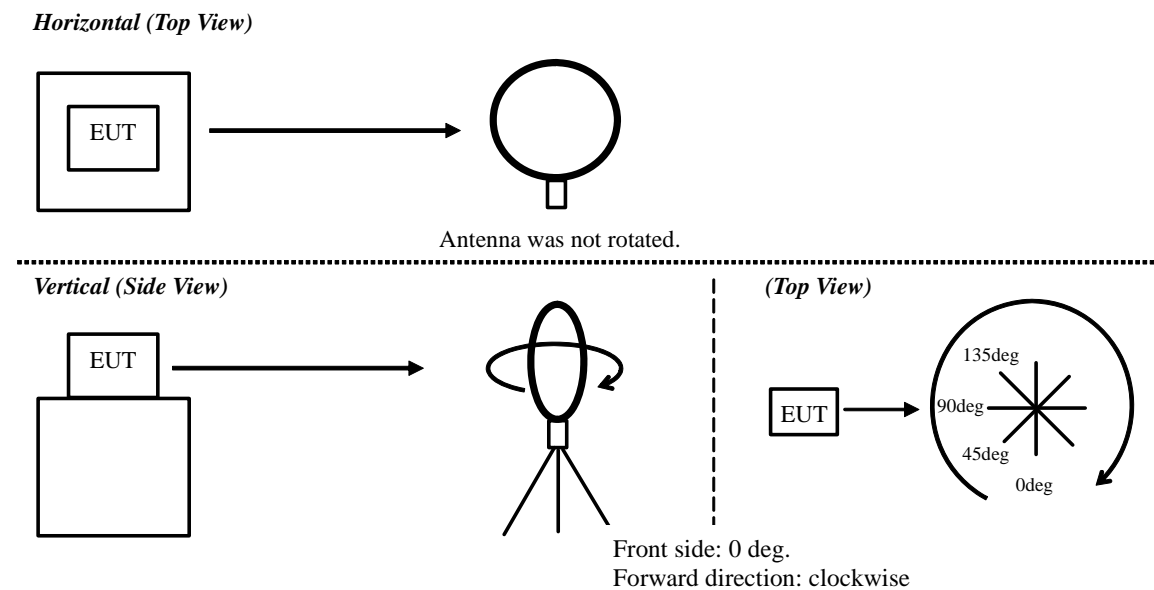
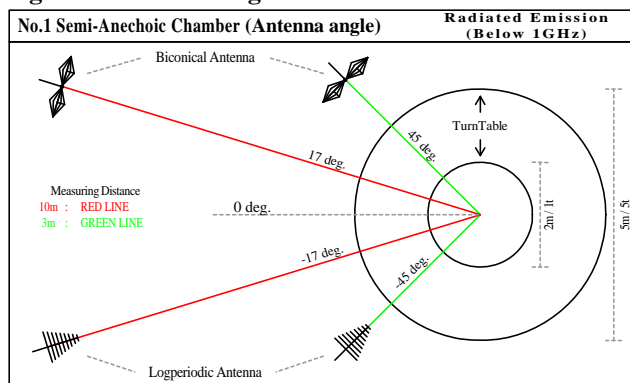


Figure 2. Antenna angle



UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

SECTION 7: 20dB bandwidth & Occupied bandwidth (99 %)

Test procedure

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

Results

Summary of the test results: Pass
Refer to APPENDIX 1.

SECTION 8: Frequency tolerances

Test procedure

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

The temperature test was started after the temperature stabilization time of 30 minutes.

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

Results

Summary of the test results: Pass
Refer to APPENDIX 1.

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

DATA OF CONDUCTED EMISSION TEST

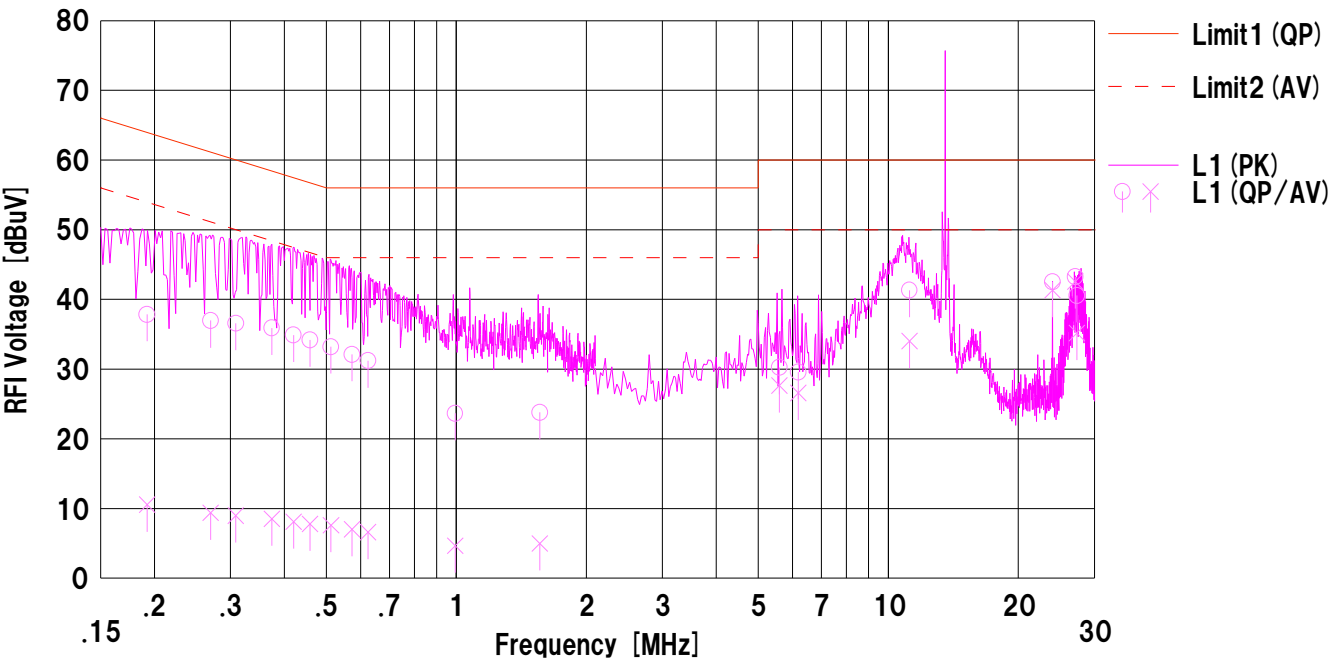
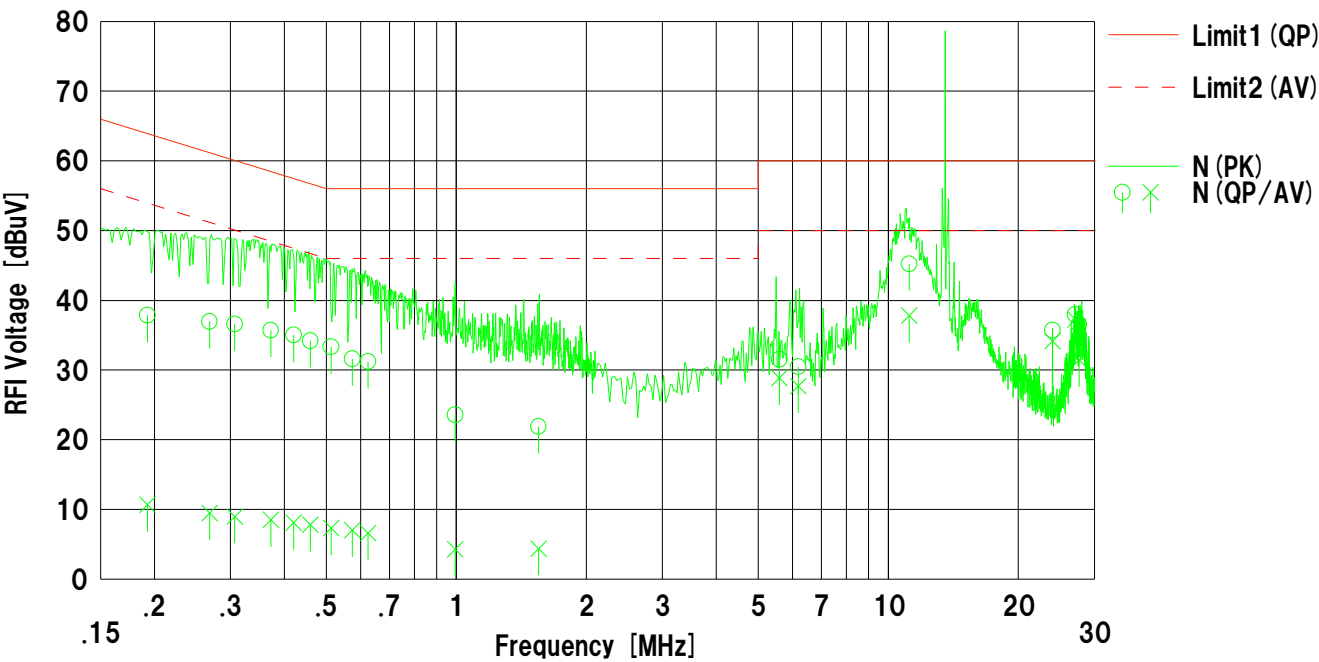
UL Japan,Inc. Shonan EMC Lab. No.5 Shielded Room
Date : 2016/12/07

Mode : Transmitting
Report No. : 11516564S
Power : AC 120 V / 60 Hz (DC 5 V)
Temp./Humi. : 23 deg.C. / 56 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Yosuke Ishikawa



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-03

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.5 Shielded Room
Date : 2016/12/07

Mode : Transmitting
Report No. : 11516564S
Power : AC 120 V / 60 Hz (DC 5 V)
Temp./Humi. : 23 deg.C. / 56 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Yosuke Ishikawa

<< QP/AV DATA >>

No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.19292	25.30	-1.90	12.56	37.86	10.66	63.91	53.91	26.0	43.2	N	
2	0.26823	24.40	-3.10	12.57	36.97	9.47	61.17	51.17	24.2	41.7	N	
3	0.30705	24.00	-3.60	12.58	36.58	8.98	60.05	50.05	23.4	41.0	N	
4	0.37197	23.10	-4.10	12.60	35.70	8.50	58.46	48.46	22.7	39.9	N	
5	0.42012	22.40	-4.50	12.60	35.00	8.10	57.45	47.45	22.4	39.3	N	
6	0.45952	21.60	-4.80	12.60	34.20	7.80	56.70	46.70	22.5	38.9	N	
7	0.51303	20.70	-5.30	12.60	33.30	7.30	56.00	46.00	22.7	38.7	N	
8	0.57415	19.00	-5.60	12.61	31.61	7.01	56.00	46.00	24.3	38.9	N	
9	0.62512	18.60	-6.00	12.61	31.21	6.61	56.00	46.00	24.7	39.3	N	
10	0.99413	10.90	-8.40	12.66	23.56	4.26	56.00	46.00	32.4	41.7	N	
11	1.55002	9.20	-8.30	12.69	21.89	4.39	56.00	46.00	34.1	41.6	N	
12	5.59491	18.60	15.90	12.94	31.54	28.84	60.00	50.00	28.4	21.1	N	
13	6.19420	17.50	14.70	12.97	30.47	27.67	60.00	50.00	29.5	22.3	N	
14	11.18894	32.00	24.60	13.22	45.22	37.82	60.00	50.00	14.7	12.1	N	
15	24.00040	21.90	20.30	13.81	35.71	34.11	60.00	50.00	24.2	15.8	N	
16	27.12000	24.00	23.30	13.95	37.95	37.25	60.00	50.00	22.0	12.7	N	
17	27.64872	22.50	17.50	13.97	36.47	31.47	60.00	50.00	23.5	18.5	N	
18	0.19234	25.30	-2.00	12.56	37.86	10.56	63.94	53.94	26.0	43.3	L1	
19	0.26978	24.40	-3.20	12.57	36.97	9.37	61.12	51.12	24.1	41.7	L1	
20	0.30876	24.00	-3.60	12.58	36.58	8.98	60.00	50.00	23.4	41.0	L1	
21	0.37384	23.30	-4.10	12.60	35.90	8.50	58.42	48.42	22.5	39.9	L1	
22	0.42003	22.30	-4.50	12.60	34.90	8.10	57.45	47.45	22.5	39.3	L1	
23	0.45822	21.60	-4.80	12.60	34.20	7.80	56.72	46.72	22.5	38.9	L1	
24	0.51284	20.60	-5.00	12.60	33.20	7.60	56.00	46.00	22.8	38.4	L1	
25	0.57388	19.50	-5.60	12.61	32.11	7.01	56.00	46.00	23.8	38.9	L1	
26	0.62465	18.60	-6.00	12.61	31.21	6.61	56.00	46.00	24.7	39.3	L1	
27	0.99373	11.00	-8.00	12.66	23.66	4.66	56.00	46.00	32.3	41.3	L1	
28	1.56012	11.10	-7.70	12.69	23.79	4.99	56.00	46.00	32.2	41.0	L1	
29	5.59564	17.30	14.70	12.94	30.24	27.64	60.00	50.00	29.7	22.3	L1	
30	6.19418	16.60	13.60	12.97	29.57	26.57	60.00	50.00	30.4	23.4	L1	
31	11.18968	28.10	20.80	13.22	41.32	34.02	60.00	50.00	18.6	15.9	L1	
32	24.00058	28.70	27.50	13.81	42.51	41.31	60.00	50.00	17.4	8.6	L1	
33	27.12000	29.30	28.60	13.95	43.25	42.55	60.00	50.00	16.7	7.4	L1	
34	27.36288	26.60	21.20	13.97	40.57	35.17	60.00	50.00	19.4	14.8	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-03

DATA OF CONDUCTED EMISSION TEST

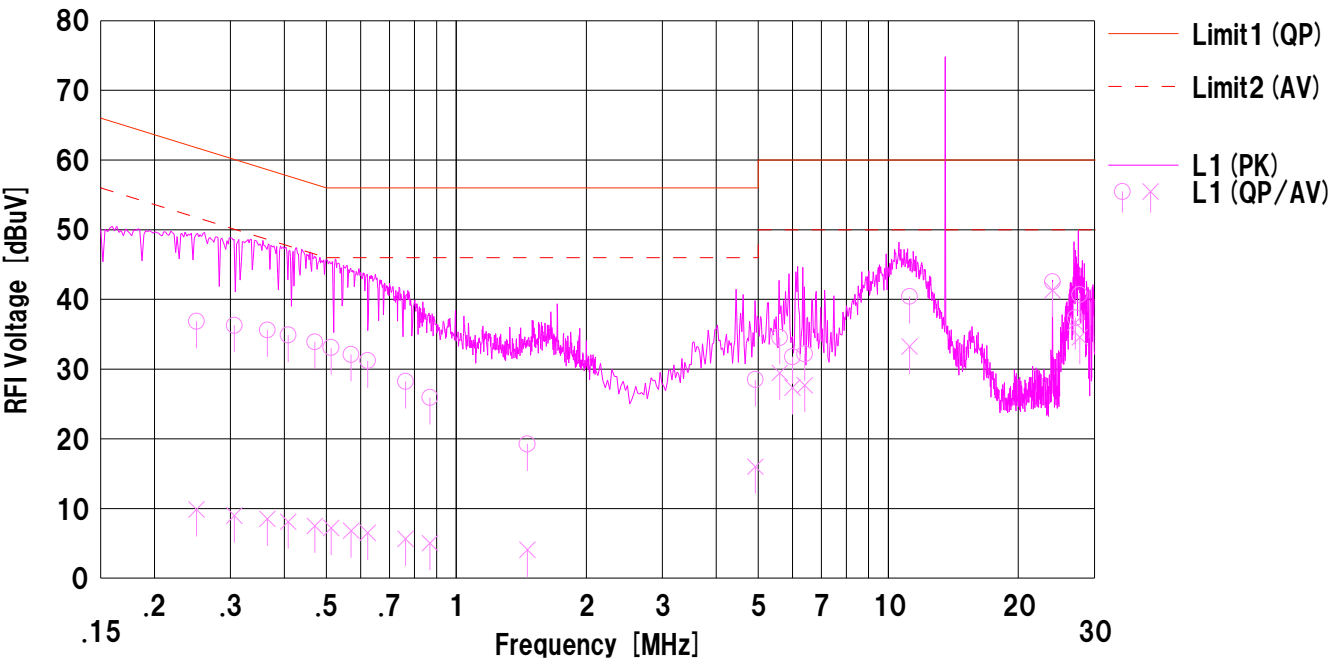
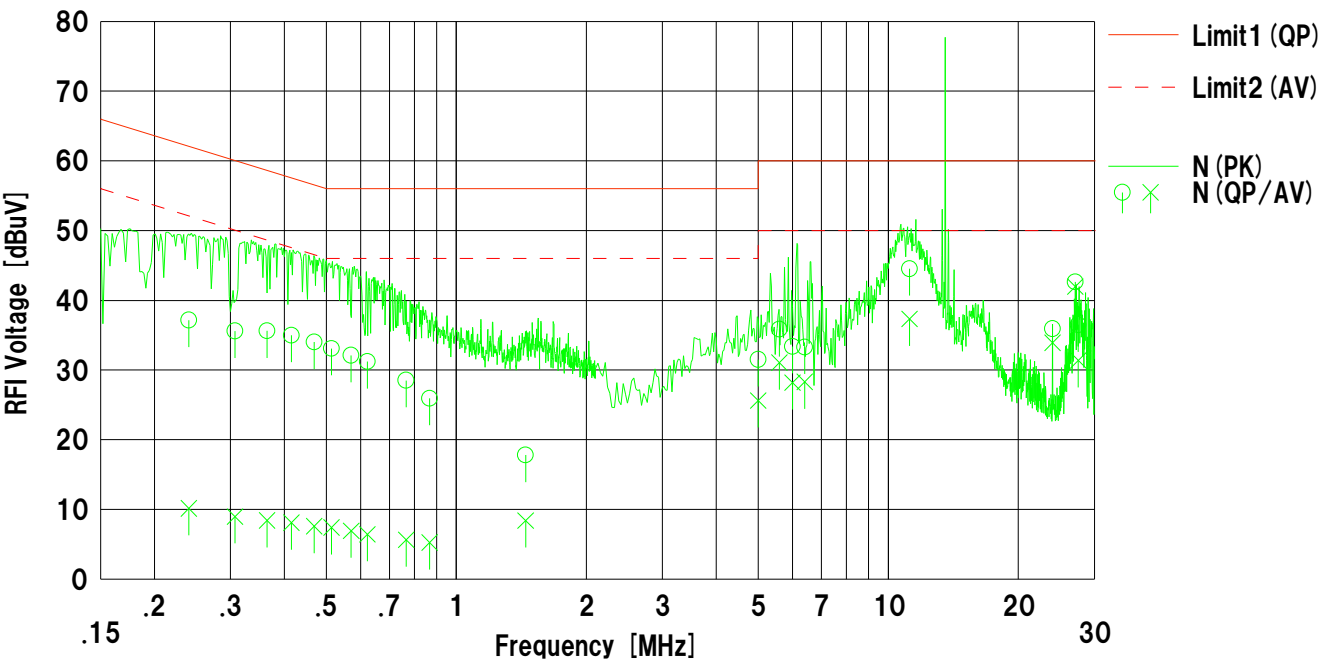
UL Japan,Inc. Shonan EMC Lab. No.5 Shielded Room
Date : 2016/12/07

Mode : Communication without Card
Report No. : 11516564S
Power : AC 120 V / 60 Hz (DC 5 V)
Temp./Humi. : 23 deg.C. / 56 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Yosuke Ishikawa



Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-03

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.5 Shielded Room
Date : 2016/12/07

Mode : Communication without Card
Report No. : 11516564S
Power : AC 120 V / 60 Hz (DC 5 V)
Temp./Humi. : 23 deg.C. / 56 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Yosuke Ishikawa

<< QP/AV DATA >>

No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.24024	24.60	-2.40	12.56	37.16	10.16	62.09	52.09	24.9	41.9	N	
2	0.30723	23.00	-3.60	12.58	35.58	8.98	60.05	50.05	24.4	41.0	N	
3	0.36496	23.00	-4.20	12.60	35.60	8.40	58.61	48.61	23.0	40.2	N	
4	0.41519	22.40	-4.50	12.59	34.99	8.09	57.54	47.54	22.5	39.4	N	
5	0.46891	21.40	-5.00	12.60	34.00	7.60	56.53	46.53	22.5	38.9	N	
6	0.51402	20.50	-5.20	12.60	33.10	7.40	56.00	46.00	22.9	38.6	N	
7	0.57109	19.50	-5.70	12.61	32.11	6.91	56.00	46.00	23.8	39.0	N	
8	0.62257	18.60	-6.20	12.61	31.21	6.41	56.00	46.00	24.7	39.5	N	
9	0.76548	15.90	-7.00	12.63	28.53	5.63	56.00	46.00	27.4	40.3	N	
10	0.86776	13.30	-7.40	12.63	25.93	5.23	56.00	46.00	30.0	40.7	N	
11	1.44670	5.10	-4.30	12.68	17.78	8.38	56.00	46.00	38.2	37.6	N	
12	4.99916	18.60	12.70	12.90	31.50	25.60	56.00	46.00	24.5	20.4	N	
13	5.60285	22.90	18.10	12.95	35.85	31.05	60.00	50.00	24.1	18.9	N	
14	6.00462	20.40	15.20	12.97	33.37	28.17	60.00	50.00	26.6	21.8	N	
15	6.40474	20.30	15.30	12.99	33.29	28.29	60.00	50.00	26.7	21.7	N	
16	11.20854	31.30	24.10	13.23	44.53	37.33	60.00	50.00	15.4	12.6	N	
17	24.00034	22.10	20.10	13.81	35.91	33.91	60.00	50.00	24.0	16.0	N	
18	27.12000	28.70	28.00	13.95	42.65	41.95	60.00	50.00	17.3	8.0	N	
19	27.55556	22.50	17.40	13.97	36.47	31.37	60.00	50.00	23.5	18.6	N	
20	0.25042	24.30	-2.70	12.56	36.86	9.86	61.74	51.74	24.8	41.8	L1	
21	0.30633	23.70	-3.60	12.58	36.28	8.98	60.07	50.07	23.7	41.0	L1	
22	0.36528	23.00	-4.10	12.60	35.60	8.50	58.61	48.61	23.0	40.1	L1	
23	0.40835	22.30	-4.50	12.59	34.89	8.09	57.68	47.68	22.7	39.5	L1	
24	0.47058	21.30	-5.10	12.60	33.90	7.50	56.50	46.50	22.6	39.0	L1	
25	0.51288	20.50	-5.40	12.60	33.10	7.20	56.00	46.00	22.9	38.8	L1	
26	0.57106	19.50	-5.80	12.61	32.11	6.81	56.00	46.00	23.8	39.1	L1	
27	0.62368	18.60	-6.10	12.61	31.21	6.51	56.00	46.00	24.7	39.4	L1	
28	0.76320	15.60	-7.00	12.63	28.23	5.63	56.00	46.00	27.7	40.3	L1	
29	0.86869	13.30	-7.60	12.63	25.93	5.03	56.00	46.00	30.0	40.9	L1	
30	1.46054	6.60	-8.60	12.68	19.28	4.08	56.00	46.00	36.7	41.9	L1	
31	4.92717	15.60	3.10	12.90	28.50	16.00	56.00	46.00	27.5	30.0	L1	
32	5.60410	21.60	16.50	12.95	34.55	29.45	60.00	50.00	25.4	20.5	L1	
33	6.00352	18.80	14.40	12.97	31.77	27.37	60.00	50.00	28.2	22.6	L1	
34	6.40435	19.20	14.70	12.99	32.19	27.69	60.00	50.00	27.8	22.3	L1	
35	11.20778	27.20	20.00	13.23	40.43	33.23	60.00	50.00	19.5	16.7	L1	
36	24.00076	28.70	27.50	13.81	42.51	41.31	60.00	50.00	17.4	8.6	L1	
37	27.12000	23.40	22.70	13.95	37.35	36.65	60.00	50.00	22.6	13.3	L1	
38	27.74564	26.70	20.60	13.98	40.68	34.58	60.00	50.00	19.3	15.4	L1	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-03

DATA OF CONDUCTED EMISSION TEST

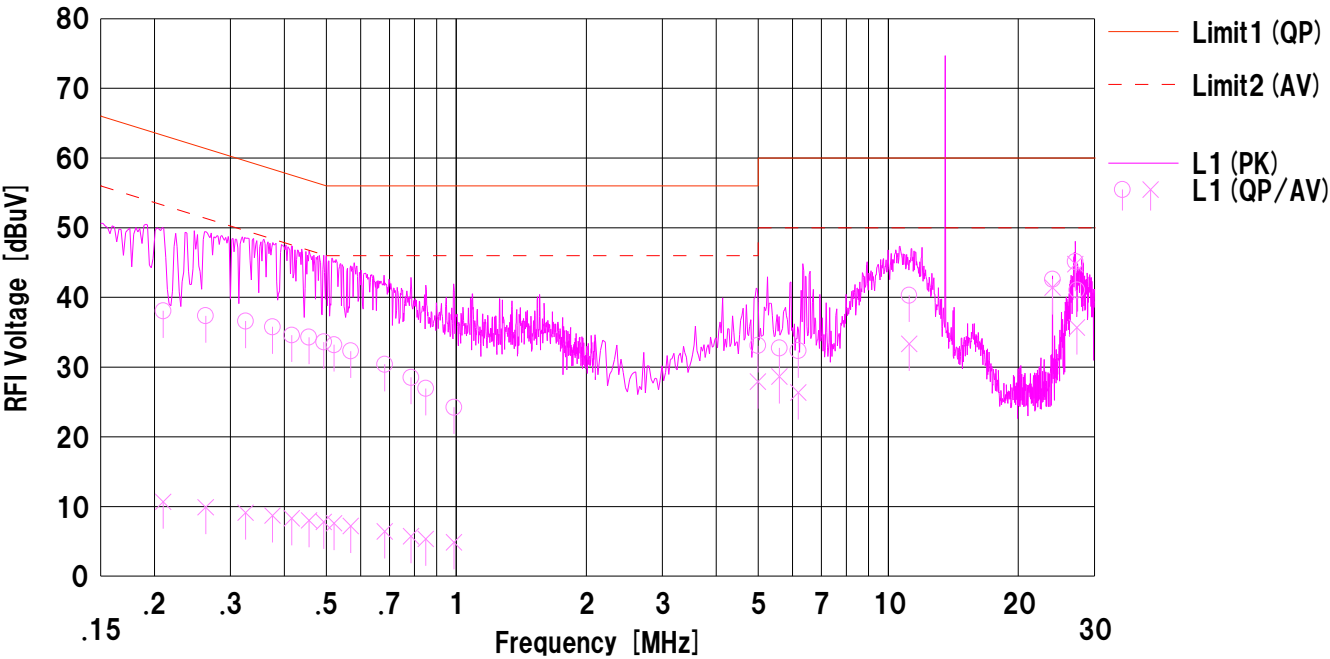
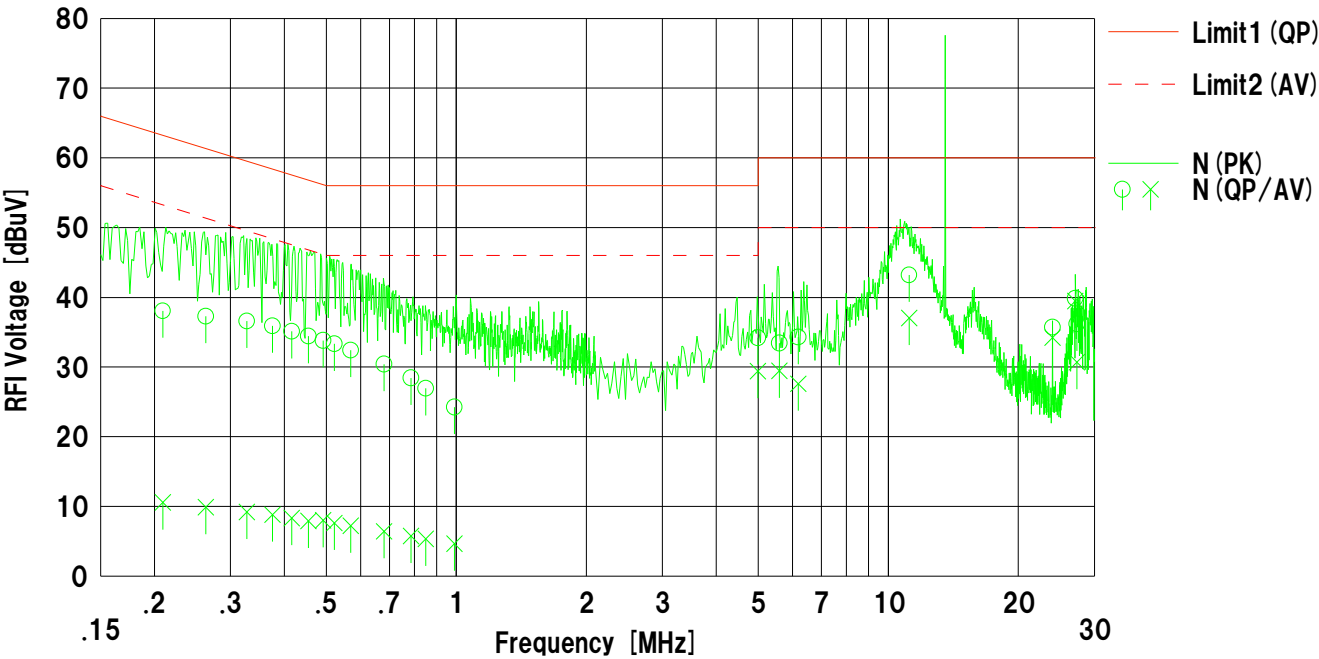
UL Japan,Inc. Shonan EMC Lab. No.5 Shielded Room
Date : 2016/12/07

Mode : Communication with Card
Report No. : 11516564S
Power : AC 120 V / 60 Hz (DC 5 V)
Temp./Humi. : 23 deg.C. / 56 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Yosuke Ishikawa



Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-03

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.5 Shielded Room
Date : 2016/12/07

Mode : Communication with Card
Report No. : 11516564S
Power : AC 120 V / 60 Hz (DC 5 V)
Temp./Humi. : 23 deg.C. / 56 %RH

Remarks : -

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Yosuke Ishikawa

<< QP/AV DATA >>

No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.20905	25.50	-2.00	12.57	38.07	10.57	63.24	53.24	25.1	42.6	N	
2	0.26315	24.70	-2.70	12.57	37.27	9.87	61.33	51.33	24.0	41.4	N	
3	0.32728	24.00	-3.40	12.60	36.60	9.20	59.52	49.52	22.9	40.3	N	
4	0.37522	23.30	-3.80	12.59	35.89	8.79	58.38	48.38	22.4	39.5	N	
5	0.41604	22.50	-4.30	12.60	35.10	8.30	57.53	47.53	22.4	39.2	N	
6	0.45482	21.80	-4.70	12.60	34.40	7.90	56.79	46.79	22.3	38.8	N	
7	0.49202	21.20	-4.60	12.60	33.80	8.00	56.13	46.13	22.3	38.1	N	
8	0.52189	20.70	-5.00	12.61	33.31	7.61	56.00	46.00	22.6	38.3	N	
9	0.56954	19.80	-5.40	12.61	32.41	7.21	56.00	46.00	23.5	38.7	N	
10	0.68054	17.80	-6.20	12.61	30.41	6.41	56.00	46.00	25.5	39.5	N	
11	0.78544	15.80	-6.90	12.63	28.43	5.73	56.00	46.00	27.5	40.2	N	
12	0.85006	14.30	-7.30	12.63	26.93	5.33	56.00	46.00	29.0	40.6	N	
13	0.99005	11.60	-8.00	12.66	24.26	4.66	56.00	46.00	31.7	41.3	N	
14	4.99193	21.30	16.50	12.90	34.20	29.40	56.00	46.00	21.8	16.6	N	
15	5.60233	20.50	16.50	12.95	33.45	29.45	60.00	50.00	26.5	20.5	N	
16	6.18894	21.30	14.60	12.97	34.27	27.57	60.00	50.00	25.7	22.4	N	
17	11.17912	30.00	23.80	13.22	43.22	37.02	60.00	50.00	16.7	12.9	N	
18	24.00088	21.90	20.40	13.81	35.71	34.21	60.00	50.00	24.2	15.7	N	
19	27.12000	25.90	25.50	13.95	39.85	39.45	60.00	50.00	20.1	10.5	N	
20	27.36159	22.20	16.70	13.97	36.17	30.67	60.00	50.00	23.8	19.3	N	
21	0.20964	25.50	-1.90	12.57	38.07	10.67	63.22	53.22	25.1	42.5	L1	
22	0.26288	24.80	-2.70	12.57	37.37	9.87	61.34	51.34	23.9	41.4	L1	
23	0.32528	24.00	-3.50	12.60	36.60	9.10	59.57	49.57	22.9	40.4	L1	
24	0.37545	23.20	-3.90	12.59	35.79	8.69	58.38	48.38	22.5	39.6	L1	
25	0.41614	22.00	-4.30	12.60	34.60	8.30	57.52	47.52	22.9	39.2	L1	
26	0.45586	21.70	-4.60	12.60	34.30	8.00	56.77	46.77	22.4	38.7	L1	
27	0.49345	21.00	-4.80	12.60	33.60	7.80	56.11	46.11	22.5	38.3	L1	
28	0.52120	20.60	-5.00	12.60	33.20	7.60	56.00	46.00	22.8	38.4	L1	
29	0.56985	19.70	-5.40	12.61	32.31	7.21	56.00	46.00	23.6	38.7	L1	
30	0.68216	17.80	-6.20	12.61	30.41	6.41	56.00	46.00	25.5	39.5	L1	
31	0.78588	15.90	-6.90	12.63	28.53	5.73	56.00	46.00	27.4	40.2	L1	
32	0.84992	14.30	-7.30	12.64	26.94	5.34	56.00	46.00	29.0	40.6	L1	
33	0.98756	11.60	-7.80	12.66	24.26	4.86	56.00	46.00	31.7	41.1	L1	
34	4.99310	20.20	15.00	12.90	33.10	27.90	56.00	46.00	22.9	18.1	L1	
35	5.60197	19.80	15.70	12.95	32.75	28.65	60.00	50.00	27.2	21.3	L1	
36	6.18816	19.40	13.40	12.97	32.37	26.37	60.00	50.00	27.6	23.6	L1	
37	11.17940	27.10	20.10	13.22	40.32	33.32	60.00	50.00	19.6	16.6	L1	
38	24.00044	28.80	27.60	13.81	42.61	41.41	60.00	50.00	17.3	8.5	L1	
39	27.12000	31.20	30.80	13.95	45.15	44.75	60.00	50.00	14.8	5.2	L1	
40	27.36250	27.10	21.70	13.97	41.07	35.67	60.00	50.00	18.9	14.3	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN:SLS-03

Data of Electric field strength of Fundamental emission and Spurious emission within the band: FCC15.225(a)(b)(c)

UL Japan, Inc.
Shonan EMC Lab., No.1 Semi Anechoic Chamber

Power: DC5 V
Mode: Transmitting 13.56 MHz

Regulation: FCC Part15 Subpart C 15.225
Test Distance: 3 m
Date: December 10, 2016
Temperature: 21 deg.C
Humidity: 26 %RH
ENGINEER: Yosuke Ishikawa

Remarks: : EUT Axis:Hor_Z / Ver_Z, Vertical polarization (antenna angle) of the worst case: 0deg

Fundamental emission

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	Loss [dB]	AMP GAIN [dB]	Distance factor [dB]	RESULT		LIMIT (30m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]					Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.560	94.90	104.80	18.87	6.67	31.84	-40.00	48.60	58.50	83.90	35.3	25.4

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

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

Limits (30 m)

• 13.553 MHz to 13.567 MHz : 83.9 dBuV/m (FCC 15.225(a))

Spurious emission within the band

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	Loss [dB]	AMP GAIN [dB]	Distance factor [dB]	RESULT		LIMIT (30m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]					Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.110	34.00	33.90	18.98	6.67	31.84	-40.00	-12.19	-12.29	29.50	41.7	41.8
2	13.410	39.20	48.20	18.91	6.67	31.84	-40.00	-7.06	1.94	40.50	47.6	38.6
3	13.553	57.00	66.80	18.87	6.67	31.84	-40.00	10.70	20.50	50.40	39.7	29.9
4	13.567	56.50	66.40	18.87	6.67	31.84	-40.00	10.20	20.10	50.40	40.2	30.3
5	13.710	38.50	47.40	18.83	6.67	31.84	-40.00	-7.84	1.06	40.50	48.3	39.4
6	14.010	33.60	33.50	18.76	6.67	31.84	-40.00	-12.81	-12.91	29.50	42.3	42.4

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

Outside filed strength frequencies

• Fc±7 kHz: 13.553 MHz to 13.567 MHz

• Fc±150 kHz: 13.410 MHz to 13.710 MHz

• Fc±450kHz: 13.110MHz to 14.010MHz

Fc = 13.56 MHz

Limits (30 m)

• 13.410 MHz to 13.553 MHz and 13.567 MHz to 13.710 MHz : 50.4 dBuV/m (FCC 15.225(b))

• 13.110 MHz to 13.410 MHz and 13.710 MHz to 14.010 MHz : 40.5 dBuV/m (FCC 15.225(c))

• Below 13.110 MHz and Above 14.010 MHz : 29.5 dBuV/m (FCC 15.225(d)and FCC 15.209)

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Data of Electric field strength of Fundamental emission and Spurious emission within the band: FCC15.225(a)(b)(c)

UL Japan, Inc.
Shonan EMC Lab., No.1 Semi Anechoic Chamber

Power: DC5 V
Mode: Communication without Card 13.56 MHz

Regulation: FCC Part15 Subpart C 15.225
Test Distance: 3 m
Date: December 10, 2016
Temperature: 21 deg.C
Humidity: 26 %RH
ENGINEER: Yosuke Ishikawa

Remarks: : EUT Axis:Hor_Z / Ver_Z, Vertical polarization (antenna angle) of the worst case: 0deg

Fundamental emission

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	Loss [dB]	AMP GAIN [dB]	Distance factor [dB]	RESULT		LIMIT (30m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]					Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.560	95.00	104.90	18.87	6.67	31.84	-40.00	48.70	58.60	83.90	35.2	25.3

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

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

Limits (30 m)

• 13.553 MHz to 13.567 MHz : 83.9 dBuV/m (FCC 15.225(a))

Spurious emission within the band

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	Loss [dB]	AMP GAIN [dB]	Distance factor [dB]	RESULT		LIMIT (30m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]					Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.110	34.00	33.90	18.98	6.67	31.84	-40.00	-12.19	-12.29	29.50	41.7	41.8
2	13.410	34.00	34.50	18.91	6.67	31.84	-40.00	-12.26	-11.76	40.50	52.8	52.3
3	13.553	57.00	66.80	18.87	6.67	31.84	-40.00	10.70	20.50	50.40	39.7	29.9
4	13.567	56.50	66.30	18.87	6.67	31.84	-40.00	10.20	20.00	50.40	40.2	30.4
5	13.710	33.70	34.50	18.83	6.67	31.84	-40.00	-12.64	-11.84	40.50	53.1	52.3
6	14.010	31.90	33.60	18.76	6.67	31.84	-40.00	-14.51	-12.81	29.50	44.0	42.3

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

Outside filed strength frequencies

• Fc±7 kHz: 13.553 MHz to 13.567 MHz

• Fc±150 kHz: 13.410 MHz to 13.710 MHz

• Fc±450kHz: 13.110MHz to 14.010MHz

Fc = 13.56 MHz

Limits (30 m)

• 13.410 MHz to 13.553 MHz and 13.567 MHz to 13.710 MHz : 50.4 dBuV/m (FCC 15.225(b))

• 13.110 MHz to 13.410 MHz and 13.710 MHz to 14.010 MHz : 40.5 dBuV/m (FCC 15.225(c))

• Below 13.110 MHz and Above 14.010 MHz : 29.5 dBuV/m (FCC 15.225(d)and FCC 15.209)

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Data of Electric field strength of Fundamental emission and Spurious emission within the band: FCC15.225(a)(b)(c)

UL Japan, Inc.
Shonan EMC Lab., No.1 Semi Anechoic Chamber

Power: DC5 V
Mode: Communication with Card 13.56 MHz

Regulation: FCC Part15 Subpart C 15.225
Test Distance: 3 m
Date: December 10, 2016
Temperature: 21 deg.C
Humidity: 26 %RH
ENGINEER: Yosuke Ishikawa

Remarks: : EUT Axis:Hor_Z / Ver_Z, Vertical polarization (antenna angle) of the worst case: 0deg

Fundamental emission

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	Loss [dB]	AMP GAIN [dB]	Distance factor [dB]	RESULT		LIMIT (30m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]					Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.560	93.70	103.90	18.87	6.67	31.84	-40.00	47.40	57.60	83.90	36.5	26.3

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

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

Limits (30 m)

• 13.553 MHz to 13.567 MHz : 83.9 dBuV/m (FCC 15.225(a))

Spurious emission within the band

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	Loss [dB]	AMP GAIN [dB]	Distance factor [dB]	RESULT		LIMIT (30m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]					Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.110	33.90	33.90	18.98	6.67	31.84	-40.00	-12.29	-12.29	29.50	41.8	41.8
2	13.410	33.80	34.80	18.91	6.67	31.84	-40.00	-12.46	-11.46	40.50	53.0	52.0
3	13.553	55.80	65.90	18.87	6.67	31.84	-40.00	9.50	19.60	50.40	40.9	30.8
4	13.567	55.20	65.40	18.87	6.67	31.84	-40.00	8.90	19.10	50.40	41.5	31.3
5	13.710	33.80	34.40	18.83	6.67	31.84	-40.00	-12.54	-11.94	40.50	53.0	52.4
6	14.010	33.60	34.50	18.76	6.67	31.84	-40.00	-12.81	-11.91	29.50	42.3	41.4

Calculation: Result[dBuV/m]=Reading[dBuV]+Ant.Fac[dB/m]+Loss(Cable+ATT)[dB]-Gain(AMP)[dB]+Distance factor[dB]

Outside filed strength frequencies

• Fc±7 kHz: 13.553 MHz to 13.567 MHz

• Fc±150 kHz: 13.410 MHz to 13.710 MHz

• Fc±450kHz: 13.110MHz to 14.010MHz

Fc = 13.56 MHz

Limits (30 m)

• 13.410 MHz to 13.553 MHz and 13.567 MHz to 13.710 MHz : 50.4 dBuV/m (FCC 15.225(b))

• 13.110 MHz to 13.410 MHz and 13.710 MHz to 14.010 MHz : 40.5 dBuV/m (FCC 15.225(c))

• Below 13.110 MHz and Above 14.010 MHz : 29.5 dBuV/m (FCC 15.225(d)and FCC 15.209)

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Emission

UL Japan, Inc.
Shonan EMC Lab. No.1 Semi Anechoic Chamber

Regulation: FCC Part15 Subpart C 15.225
Test Distance: 3 m
Date: December 10, 2016
Temperature: 21 deg.C
Humidity: 26 %RH
ENGINEER: Yosuke Ishikawa

Power: DC5 V
Mode: Transmitting 13.56 MHz
EUT axis: Below 30 MHz(Horizontal Z-axis, Vertical Z-axis)
Above 30 MHz(Horizontal: X-axis, Vertical: X-axis)

Remarks:

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	27.120	QP	29.70	18.59	6.97	31.82	-40.00	-16.56	29.50	46.1	-	0	* Limit: 30m
Hori.	135.602	QP	38.40	14.14	8.52	31.79	0.00	29.27	43.50	14.2	245	359	
Hori.	162.731	QP	36.90	15.46	8.79	31.77	0.00	29.38	43.50	14.1	202	359	
Hori.	244.076	QP	40.80	11.60	6.14	31.73	0.00	26.81	46.00	19.2	135	95	
Hori.	515.282	QP	37.30	17.79	7.88	31.92	0.00	31.05	46.00	15.0	100	87	
Hori.	542.394	QP	37.40	18.20	8.03	31.99	0.00	31.64	46.00	14.4	100	250	
Hori.	623.767	QP	32.40	19.24	8.43	32.01	0.00	28.06	46.00	17.9	100	250	* Limit: 30m
Vert.	27.120	QP	30.10	18.59	6.97	31.83	-40.00	-16.17	29.50	45.7	-	316	
Vert.	244.079	QP	40.70	11.60	6.14	31.73	0.00	26.71	46.00	19.3	100	116	
Vert.	360.000	QP	44.00	14.79	7.02	31.78	0.00	34.03	46.00	12.0	165	307	
Vert.	461.043	QP	37.40	16.81	7.58	31.88	0.00	29.91	46.00	16.1	100	166	
Vert.	488.164	QP	37.20	17.33	7.73	31.88	0.00	30.38	46.00	15.6	100	159	
Vert.	542.396	QP	36.10	18.20	8.03	31.99	0.00	30.34	46.00	15.7	128	98	
Vert.	623.758	QP	33.80	19.24	8.43	32.01	0.00	29.46	46.00	16.5	110	42	

Result = Reading + Ant Factor + Loss (Cable+ATT+ΔAF(above 30MHz)) - Gain(Amplifier) + Distance factor(below 30MHz)

* Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

* Carrier level (Result at 3 m): Hor= 88.60 dBuV/m, Ver= 98.50 dBuV/m

Radiated Emission

UL Japan, Inc.
Shonan EMC Lab. No.1 Semi Anechoic Chamber

Regulation: FCC Part15 Subpart C 15.225
Test Distance: 3 m
Date: December 10, 2016
Temperature: 21 deg.C
Humidity: 26 %RH
ENGINEER: Yosuke Ishikawa

Power: DC5 V
Mode: Communication without Card 13.56 MHz
EUT axis: Below 30 MHz(Horizontal Z-axis, Vertical Z-axis)
Above 30 MHz(Horizontal: X-axis, Vertical: X-axis)

Remarks:

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	27.120	QP	29.80	18.59	6.97	31.82	-40.00	-16.46	29.50	46.0	-	0	* Limit: 30m
Hori.	135.595	QP	38.40	14.14	8.52	31.79	0.00	29.27	43.50	14.2	237	46	
Hori.	157.545	QP	30.80	15.21	8.74	31.78	0.00	22.97	43.50	20.5	192	226	
Hori.	162.717	QP	35.70	15.46	8.79	31.77	0.00	28.18	43.50	15.3	204	224	
Hori.	165.118	QP	34.10	15.58	8.81	31.77	0.00	26.72	43.50	16.8	203	295	
Hori.	515.273	QP	37.20	17.79	7.88	31.92	0.00	30.95	46.00	15.1	100	298	
Hori.	542.399	QP	37.70	18.20	8.03	31.99	0.00	31.94	46.00	14.1	100	220	* Limit: 30m
Vert.	27.120	QP	30.10	18.59	6.97	31.83	-40.00	-16.17	29.50	45.7	-	334	
Vert.	34.936	QP	37.20	16.24	7.21	31.83	0.00	28.82	40.00	11.2	100	220	
Vert.	45.882	QP	49.90	12.23	7.40	31.82	0.00	37.71	40.00	2.3	100	292	
Vert.	64.611	QP	49.00	7.15	7.67	31.81	0.00	32.01	40.00	8.0	100	209	
Vert.	101.562	QP	36.70	10.35	8.17	31.80	0.00	23.42	43.50	20.1	100	222	
Vert.	461.038	QP	37.50	16.81	7.58	31.88	0.00	30.01	46.00	16.0	141	113	
Vert.	542.401	QP	36.40	18.20	8.03	31.99	0.00	30.64	46.00	15.4	136	104	

Result = Reading + Ant Factor + Loss (Cable+ATT+ΔAF(above 30MHz)) - Gain(Amplifier) + Distance factor(below 30MHz)

* Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

* Carrier level (Result at 3 m): Hor= 88.70 dBuV/m, Ver= 98.60 dBuV/m

Radiated Emission

UL Japan, Inc.
Shonan EMC Lab. No.1 Semi Anechoic Chamber

Regulation: FCC Part15 Subpart C 15.225
Test Distance: 3 m
Date: December 10, 2016
Temperature: 21 deg.C
Humidity: 26 %RH
ENGINEER: Yosuke Ishikawa

Power: DC5 V
Mode: Communication with Card 13.56 MHz
EUT axis: Below 30 MHz(Horizontal Z-axis, Vertical Z-axis)
Above 30 MHz(Horizontal: X-axis, Vertical: X-axis)

Remarks:

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	27.120	QP	29.70	18.59	6.97	31.82	-40.00	-16.56	29.50	46.1	-	0	* Limit: 30m
Hori.	67.803	QP	36.40	6.68	7.72	31.81	0.00	18.99	40.00	21.0	255	350	
Hori.	122.045	QP	36.40	13.17	8.38	31.79	0.00	26.16	43.50	17.3	267	199	
Hori.	135.596	QP	40.80	14.14	8.52	31.79	0.00	31.67	43.50	11.8	249	193	
Hori.	203.971	QP	36.70	11.67	5.80	31.76	0.00	22.41	43.50	21.1	157	213	
Hori.	230.520	QP	51.50	11.63	6.02	31.74	0.00	37.41	46.00	8.6	161	22	
Hori.	515.280	QP	37.10	17.79	7.88	31.92	0.00	30.85	46.00	15.2	100	299	* Limit: 30m
Vert.	27.120	QP	30.30	18.59	6.97	31.83	-40.00	-15.97	29.50	45.5	-	301	
Vert.	34.875	QP	40.60	16.26	7.21	31.83	0.00	32.24	40.00	7.8	100	245	
Vert.	40.662	QP	40.70	14.16	7.31	31.82	0.00	30.35	40.00	9.7	100	328	
Vert.	46.110	QP	49.40	12.15	7.40	31.82	0.00	37.13	40.00	2.9	100	160	
Vert.	63.371	QP	50.30	7.34	7.65	31.81	0.00	33.48	40.00	6.5	100	218	
Vert.	67.818	QP	50.60	6.68	7.72	31.81	0.00	33.19	40.00	6.8	100	352	
Vert.	230.524	QP	50.50	11.63	6.02	31.74	0.00	36.41	46.00	9.6	100	136	
Vert.	552.006	QP	38.50	18.35	8.09	32.01	0.00	32.93	46.00	13.1	100	64	

Result = Reading + Ant Factor + Loss (Cable+ATT+ΔAF(above 30MHz)) - Gain(Amplifier) + Distance factor(below 30MHz)

* Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

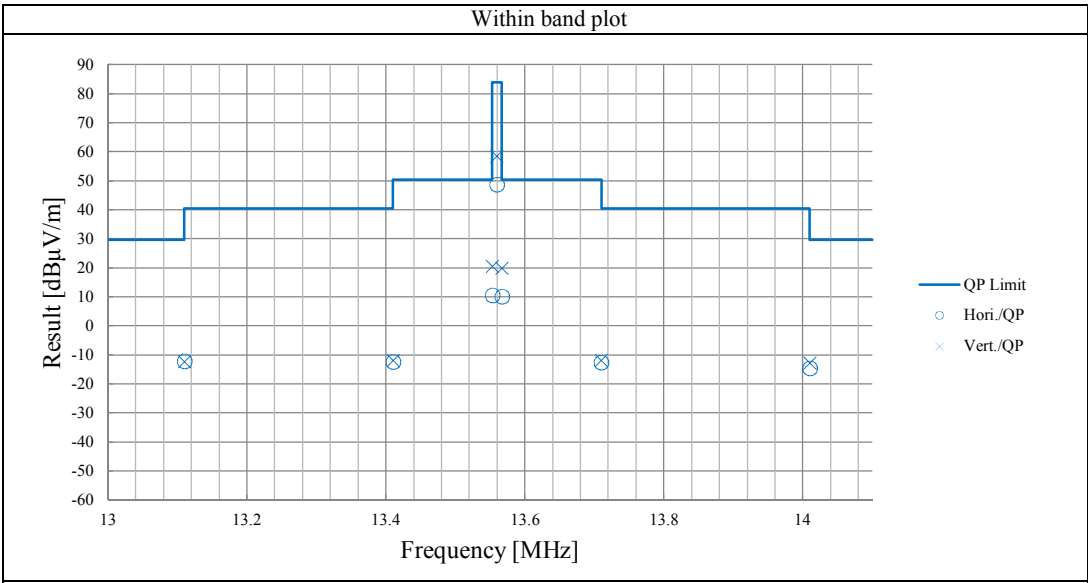
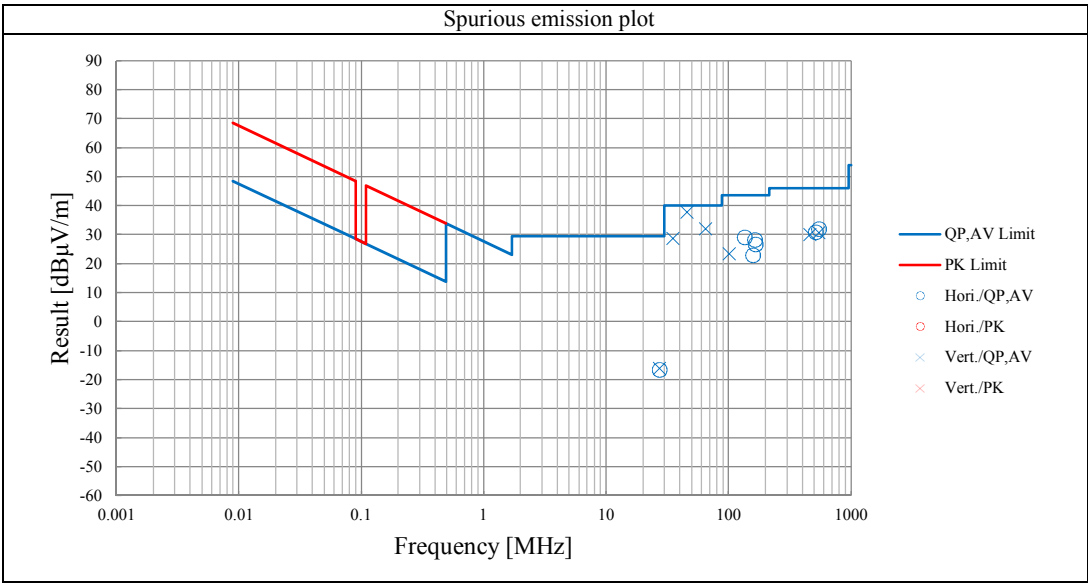
* Carrier level (Result at 3 m): Hor= 87.4 dBuV/m, Ver= 97.6 dBuV/m

Radiated Emission (Worst mode plot)

UL Japan, Inc.
Shonan EMC Lab. No.1 Semi Anechoic Chamber

Regulation: FCC Part15 Subpart C 15.225
Test Distance: 3 m
Date: December 10, 2016
Temperature: 21 deg.C
Humidity: 26 %RH
ENGINEER: Yosuke Ishikawa

Power: DC5 V
Mode: Communication without Card 13.56 MHz
EUT axis: Below 30 MHz(Horizontal Z-axis, Vertical Z-axis)
Above 30 MHz(Horizontal: X-axis, Vertical: X-axis)
Remarks: These plots data contains sufficient number to show the trend of characteristic features for EUT.



Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded room

Power DC 5 V
Mode Continuous wave 13.56 MHz

Regulation FCC Part15 Subpart C 15.225 (e)
Date December 13, 2016
Temperature 24 deg.C
Humidity 37 %RH
ENGINEER Hiroyuki Morikawa

Temperature Variation: -20 deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559974	-0.000026	-0.00019	0.010
after 2minutes	13.56	13.559996	-0.000004	-0.00003	0.010
after 5minutes	13.56	13.559999	-0.000001	-0.00001	0.010
after 10minutes	13.56	13.560001	0.000001	0.00001	0.010

Temperature Variation: -10 deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560024	0.000024	0.00018	0.010
after 2minutes	13.56	13.560035	0.000035	0.00026	0.010
after 5minutes	13.56	13.560036	0.000036	0.00027	0.010
after 10minutes	13.56	13.560037	0.000037	0.00027	0.010

Temperature Variation: 0 deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560044	0.000044	0.00032	0.010
after 2minutes	13.56	13.560046	0.000046	0.00034	0.010
after 5minutes	13.56	13.560046	0.000046	0.00034	0.010
after 10minutes	13.56	13.560046	0.000046	0.00034	0.010

Temperature Variation: 10 deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560042	0.000042	0.00031	0.010
after 2minutes	13.56	13.560038	0.000038	0.00028	0.010
after 5minutes	13.56	13.560037	0.000037	0.00027	0.010
after 10minutes	13.56	13.560037	0.000037	0.00027	0.010

Temperature Variation: 20 deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560026	0.000026	0.00019	0.010
after 2minutes	13.56	13.560020	0.000020	0.00015	0.010
after 5minutes	13.56	13.560018	0.000018	0.00013	0.010
after 10minutes	13.56	13.560018	0.000018	0.00013	0.010

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Data of Frequency Tolerance

Temperature Variation: 30 deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560004	0.000004	0.00003	0.010
after 2minutes	13.56	13.559997	-0.000003	-0.00002	0.010
after 5minutes	13.56	13.559995	-0.000005	-0.00004	0.010
after 10minutes	13.56	13.559994	-0.000006	-0.00004	0.010

Temperature Variation: 40 deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559983	-0.000017	-0.00013	0.010
after 2minutes	13.56	13.559977	-0.000023	-0.00017	0.010
after 5minutes	13.56	13.559977	-0.000023	-0.00017	0.010
after 10minutes	13.56	13.559976	-0.000024	-0.00018	0.010

Temperature Variation: 50 deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559970	-0.000030	-0.00022	0.010
after 2minutes	13.56	13.559970	-0.000030	-0.00022	0.010
after 5minutes	13.56	13.559970	-0.000030	-0.00022	0.010
after 10minutes	13.56	13.559970	-0.000030	-0.00022	0.010

Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded room

Power DC 5 V
Mode Continuous wave 13.56 MHz

Regulation FCC Part15 Subpart C 15.225 (e)
Date December 13, 2016
Temperature 24 deg.C
Humidity 37 %RH
ENGINEER Hiroyuki Morikawa

Voltage Variation: DC 4.25 V**Temperature Variation: 20 deg.C**

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560023	0.000023	0.00017	0.010
after 2minutes	13.56	13.560020	0.000020	0.00015	0.010
after 5minutes	13.56	13.560020	0.000020	0.00015	0.010
after 10minutes	13.56	13.560020	0.000020	0.00015	0.010

Voltage Variation: DC 5.5 V(*)**Temperature Variation: 20 deg.C**

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560021	0.000021	0.00015	0.010
after 2minutes	13.56	13.560016	0.000016	0.00012	0.010
after 5minutes	13.56	13.560016	0.000016	0.00012	0.010
after 10minutes	13.56	13.560015	0.000015	0.00011	0.010

* Maximum operating voltage

UL Japan, Inc.

Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

20 dB bandwidth & 99 % Occupied bandwidth: FCC 15.215 / RSS-Gen

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded Room

Regulation: FCC Part15 Subpart C 15.215

Date: December 13, 2016

Temperature: 24 deg.C

Humidity: 37 %RH

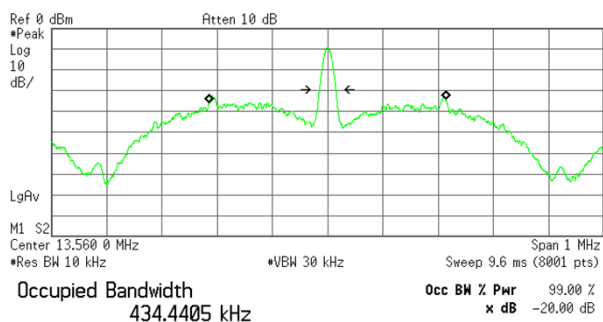
ENGINEER: Hiroyuki Morikawa

Power: DC5 V
Mode: Transmitting 13.56 MHz

20 dB Bandwidth: 29.628 kHz

* Agilent

R T

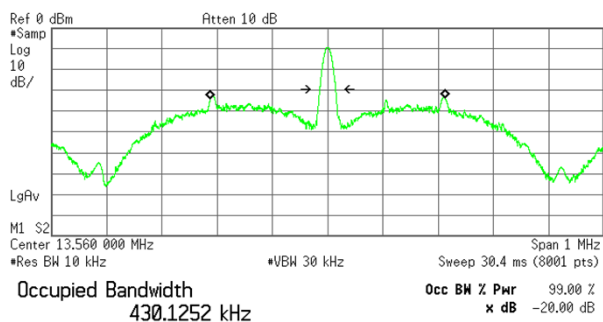


Transmit Freq Error -314.084 Hz
x dB Bandwidth 29.628 kHz

99 % Occupied Bandwidth: 430.125 kHz

* Agilent

R T



Transmit Freq Error 373.953 Hz
x dB Bandwidth 29.024 kHz*

UL Japan, Inc.**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

20 dB bandwidth & 99 % Occupied bandwidth: FCC 15.215 / RSS-Gen

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded Room

Regulation: FCC Part15 Subpart C 15.215

Date: December 13, 2016

Temperature: 24 deg.C

Humidity: 37 %RH

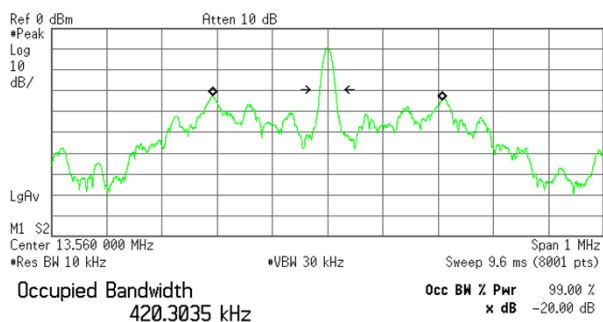
ENGINEER: Hiroyuki Morikawa

Power: DC5 V
Mode: Communication without card 13.56MHz

20 dB Bandwidth: 28.777 kHz

* Agilent

R T

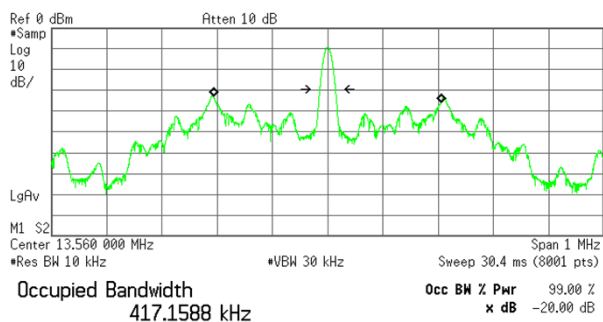


Transmit Freq Error -612.099 Hz
x dB Bandwidth 28.777 kHz

99 % Occupied Bandwidth: 417.159 kHz

* Agilent

R T



Transmit Freq Error -456.539 Hz
x dB Bandwidth 28.585 kHz*

UL Japan, Inc.**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

20 dB bandwidth & 99 % Occupied bandwidth: FCC 15.215 / RSS-Gen

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded Room

Regulation: FCC Part15 Subpart C 15.215

Date: December 13, 2016

Temperature: 24 deg.C

Humidity: 37 %RH

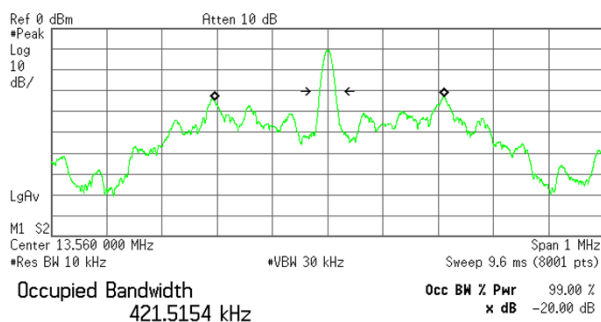
ENGINEER: Hiroyuki Morikawa

Power: DC5 V
Mode: Communication with card 13.56MHz

20 dB Bandwidth: 29.164 kHz

* Agilent

R T

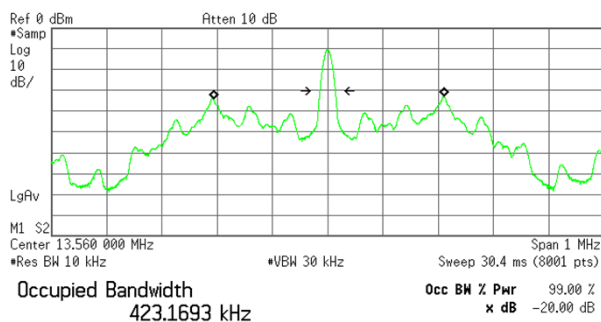


Transmit Freq Error 3.425 kHz
x dB Bandwidth 29.164 kHz

99 % Occupied Bandwidth: 423.169 kHz

* Agilent

R T



Transmit Freq Error 2.611 kHz
x dB Bandwidth 28.328 kHz*

UL Japan, Inc.**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	CE	2016/03/28 * 12
SCC-05	Coaxial Cable	Fujikura	5D2W	-	CE	2016/04/22 * 12
SLS-03	LISN	Rohde & Schwarz	ENV216	100513	CE	2016/02/08 * 12
SLS-04	LISN	Rohde & Schwarz	ENV216	100514	CE	2016/02/09 * 12
SAT3-06	Attenuator	JFW	50HF-003N	-	CE	2016/02/25 * 12
STM-03	Terminator	TME	CT-01 BP	-	CE	2015/12/18 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFL,MF)	-	CE, RE	-
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	CE	2015/12/07 * 12
SJM-17	Measure	ASKUL	-	-	CE	-
STS-05	Digital Hitester	Hioki	3805-50	080997828	CE	2016/10/17 * 12
SCC-B12/B13/ SRSE-02	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/N S4906	-/0901-270(RF Selector)	CE	2016/04/22 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	CE	2015/12/07 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	CE	2016/09/28 * 12
SJM-09	Measure	PROMART	SEN1935	-	CE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	CE	2016/03/22 * 12
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2016/02/19 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2015/12/18 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2016/08/04 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2016/10/15 * 12
SCC-A1/A3/A5/ A7/A8/A13/S RSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-269(RF Selector)	RE	2016/04/22 * 12
SCC-A2/A4/A6/ A7/A8/A13/S RSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-269(RF Selector)	RE	2016/04/22 * 12
SLA-05	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	193	RE	2016/01/30 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2016/10/12 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2016/11/29 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2016/07/14 * 12
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2016/10/17 * 12
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2016/10/28 * 12
SAT6-12	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2016/08/04 * 12

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

APPENDIX 2 Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	BW	2016/09/26 * 12
SFC-01	Microwave Counter	Agilent	53151A	US40511493	FT	2016/04/13 * 12
SSCA-01	Search coil	LANGER	RF-R 400-1	02-0634	FT, BW	Pre Check
SCH-01	Temperature and Humidity Chamber	Espec	PL-1KT	14020837	FT, BW	2016/04/14 * 12
SOS-10	Humidity Indicator	A&D	AD-5681	4064561	FT, BW	2016/10/12 * 12
KTS-07	Digital Tester	SANWA	PC500	7019232	FT, BW	2016/10/17 * 12

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 :

FT: Frequency tolerance ,

BW: 20dB Bandwidth