RADIO TEST REPORT

Test Report No. : 11502065H-A-R2

Applicant	:	**Seedsware Corporation**
Type of Equipment	:	**NFC Module**
Model No.	:	**AN-2000**
Test regulation	:	**FCC Part 15 Subpart C: 2016**
FCC ID	:	**2AJ9J002**
Test Result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 11502065H-A-R1. 11502065H-A-R1 is replaced with this report.

Date of test: October 16 to December 12, 2016

Representative test engineer:
Tomoki Matsui
Engineer
Consumer Technology Division

Approved by:
Tsubasa Takayama
Engineer
Consumer Technology Division

NVLAP TESTING
NVLAP LAB CODE: 200572-0

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.
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REVISION HISTORY

Original Test Report No.: 11502065H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11502065H-A	November 25, 2016	-	-
- (Original)	11502065H-B	November 30, 2016	-	-
1	11502065H-A-R1	December 12, 2016	All Page	Addition of Cradle data
1	11502065H-A-R1	December 12, 2016	P.5	Correction of Worst margin for Electric Field Strength of Fundamental Emission and Spectrum Mask in Clause 3.2.
1	11502065H-A-R1	December 12, 2016	P.10	Addition of Configuration and peripherals for Cradle in Clause 4.2.
1	11502065H-A-R1	December 12, 2016	P.24, 25	Retesting of 20dB Bandwidth and 99% Occupied Bandwidth test
2	11502065H-A-R2	December 15, 2016	P.5	Correction of FCC Part 15.31 (e) in Clause 3.2.
2	11502065H-A-R2	December 15, 2016	P.24, 25	Retesting of 20dB Bandwidth and 99% Occupied Bandwidth test.

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SECTION 1: Customer information

Company Name	:	Seedsware Corporation
Address	:	3-7-16, Technostage, Izumi-shi, Osaka 594-1144, Japan
Telephone Number	:	+81-725-51-1110
Facsimile Number	:	+81-725-51-1103
Contact Person	:	Masayuki Tomita

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

2.1 Identification of E.U.T.

Type of Equipment	:	NFC Module
Model No.	:	AN-2000
Serial No.	:	Refer to Section 4, Clause 4.2
Receipt Date of Sample	:	November 11, 2016
Country of Mass-production	:	Japan
Condition of EUT	:	Production model
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model No: AN-2000, (referred to as the EUT in this report), is the NFC Module.

Radio Specification

NFC

Radio Type	:	Transceiver
Frequency of Operation	:	13.56 MHz
Modulation	:	ASK
Power Supply (radio part input)	:	DC 3.3 V
Antenna type	:	13.56 MHz Pattern antenna
Clock frequency	:	27.12 MHz

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 15.225 : Operation within the band 13.110 MHz - 14.010MHz

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

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] 13.6 dB, 0.16740 MHz, L [AV] 10.0 dB, 0.16648 MHz, N	Complied	Radiated
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	68.9 dB, 13.56000 MHz, QP, 0 deg.	Complied	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	39.5 dB, 14.40740 MHz, QP, 0 deg.	Complied	Radiated
20dB Bandwidth	ANSI C63.10:2013 6 Standard test methods ---------- <IC> -	Section15.215(c) ---------- <IC> -	See data	Complied	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	0.4 dB 124.917 MHz, Vertical, QP	Complied	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	Radiated
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

FCC Part 15.31 (e)
The stable voltage was supplied by the end product which was required to have a power supply regulator. Therefore, the 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
The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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	N/A

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

3.4 Uncertainty

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

Frequency range	Conducted emission using AMN(LISN) (+/-)
0.009 – 0.15MHz	3.5 dB
0.15 – 30MHz	3.0 dB

Test distance	Radiated emission (+/-)
	9 kHz - 30 MHz
3m	3.8 dB
10m	3.7 dB

*Measurement distance

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 - 200 MHz	200 - 1000MHz	30 - 200 MHz	200 - 1000MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 - 6GHz	6 - 18GHz	10 - 26.5 GHz	26.5 - 40GHz	1 - 18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

* Measurement distance

Frequency counter (+)	
Normal condition	Extreme condition
7×10^{-6}	9×10^{-6}

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

Radiated emission test (3 m)
[Electric Field Strength of Fundamental Emission and Spectrum Mask]
The data listed in this test report has enough margin, more than the site margin.

[Electric Field Strength of Spurious Emission**]**
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.5 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. Code: 200572-0
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	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.0 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

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

3.6 Test set up, Test data, and Test instruments

Refer to APPENDIX.

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

4.1 Operating Modes

The mode is used :

Mode	Remarks*
Transmitting mode (Tx) 13.56 MHz Mod on	The EUT Transmits and Receives at the same time and there is no receiving mode.
Any condition under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

Test Item	Operating mode
Conducted emission	Tx with Tag Tx without Tag
Electric Field Strength of Fundamental Emission	Tx with Tag
Spectrum Mask	Tx with Tag
Electric Field Strength of Spurious Emission	Tx with Tag Tx without Tag
20dB Bandwidth and 99% Occupied Bandwidth	Tx with Tag
Frequency Tolerance	Tx with Tag

*The carrier level and noise levels were confirmed with and without Card, and the test was performed with the condition that has maximum noise.

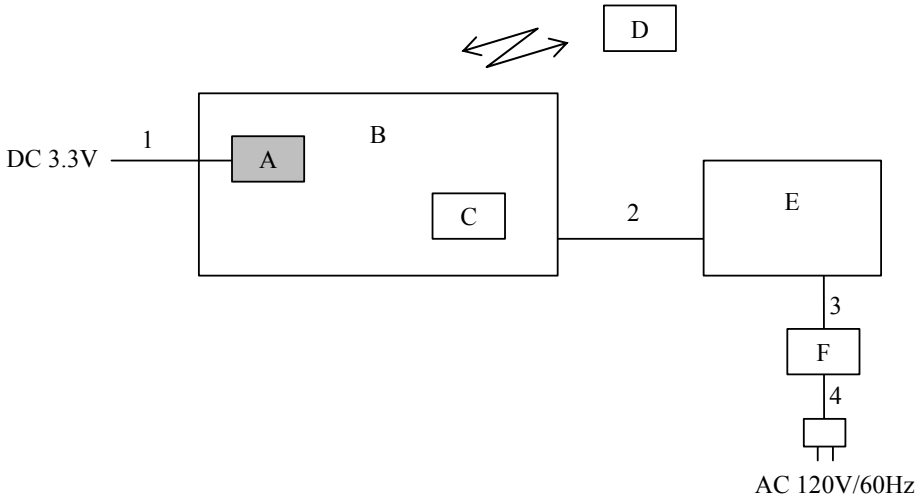
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

Frequency Tolerance:

Temperature : -20deg.C to +50deg.C Step 10deg.C
Voltage : Normal Voltage DC 3.3 V
Maximum Voltage DC 3.795 V
Minimum Voltage DC 2.805 V
(DC 3.3 V ±15%)

4.2 Configuration and peripherals

[Tablet]



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

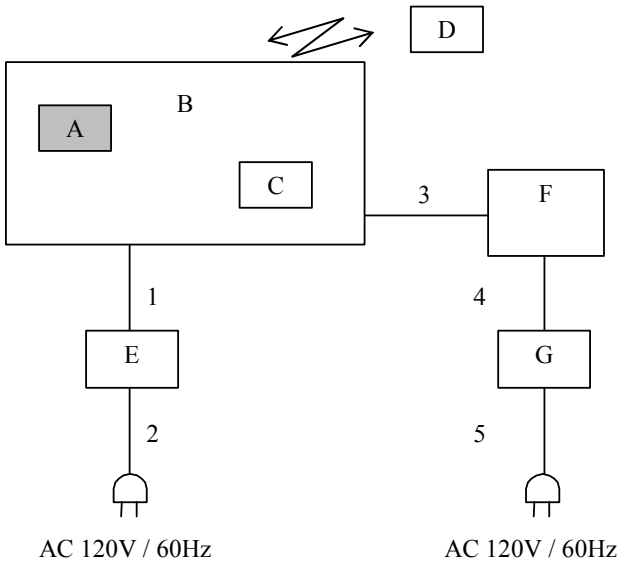
Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	NFC Module	AN-2000	14J090022	Seedsware Corporation	EUT
B	WLAN/NFC Tablet	IST01-7WS1-SSS-01	0000000009	Seedsware Corporation	-
C	Battery	BJ-T310016AA	1511A	Panasonic	-
D	Tag	MIFARE	1	FUJIFILM Imaging Systems	106kbps
E	Laoptop PC	43405	SPB14025	hp	-
F	AC Adapter	NSW24187	WCNXA0C1R4VL87	hp	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	Frequency Tolerance test only
2	Lan Cable	3.0	Unshielded	Unshielded	-
3	DC Cable	1.8	Unshielded	Unshielded	-
4	AC Cable	1.8	Unshielded	Unshielded	-

[Cradle]



* Cabling and setup 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 Module	AN-2000	14J090022	Seedsware Corporation	EUT
B	Cradle	ISC01-NNB1-SSS-01	0000000004	Seedsware Corporation	-
C	SD Card	-	-	-	-
D	Tag	MIFARE	1	FUJIFILM Imaging Systems	106kbps
E	Power supply jig	PMC35-2A	13090501	KIKUSUI	for CE*
	Power supply jig	PBA75F-24	9219608LR	COSEL	for RE*
F	Personal Computer	HSTNN-A25C	CNC636028B	hp	-
G	AC Adapter	PCGA-AC19V2	214071310-5	SONY	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	0.6	Unshielded	Unshielded	-
2	AC Cable	1.8 for CE* 2.4 for RE*	Unshielded	Unshielded	*1)
3	LAN Cable	2.1	Unshielded	Unshielded	-
4	DC Cable	2.9	Unshielded	Unshielded	-
5	AC Cable	0.8	Unshielded	Unshielded	-

*1) Conducted Emission test was performed on this AC Cable.

* CE: Conducted emission
RE: Radiated emission

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

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., 45 deg., 90 deg., and 135 deg.)
and horizontal polarization.
*Refer to Figure 1 about Direction of the Loop Antenna.

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

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

Test Antennas are used as below;

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

Frequency	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz
Instrument used	Test Receiver				
Detector	PK / AV	QP	PK / AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz
Test Distance	3 m *1)	3 m *1)	3 m *1)	3 m *2)	3 m

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

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 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 carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

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

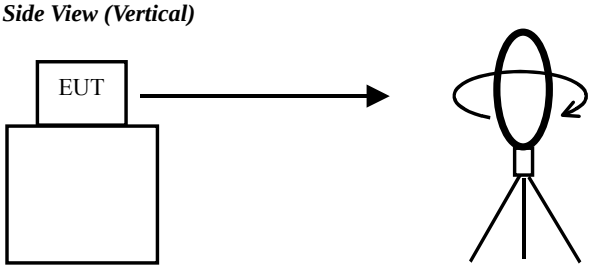
SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	1 MHz	10 kHz	30 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter Spectrum Analyzer
*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %. Peak hold was applied as Worst-case measurement.							

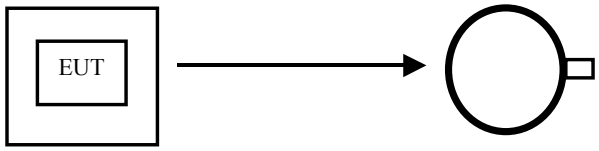
Test data : **APPENDIX**
Test result : **Pass**

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

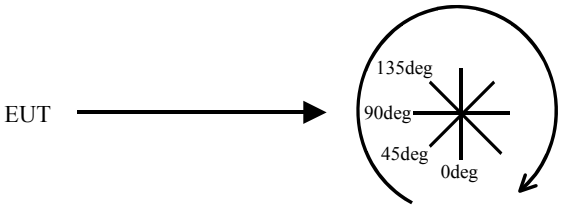


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

APPENDIX 1: Test data

Conducted emission

Tablet

DATA OF CONDUCTED EMISSION TEST

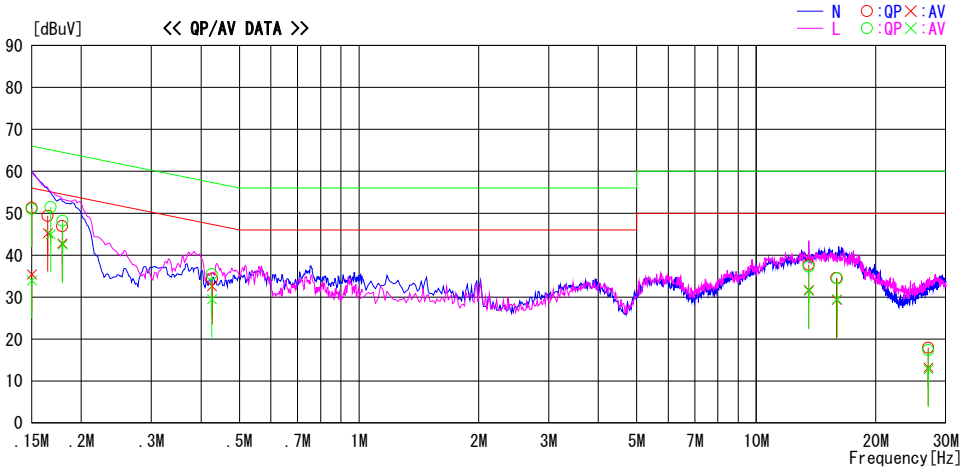
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/11/18

Report No. : 11502065H

Temp./Humi. : 20deg. C / 45% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx 13.56MHz, without Tag (with Antenna)

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	37.8	20.8	13.2	51.0	34.0	66.0	56.0	15.0	22.0	L	
0.15000	38.1	22.2	13.2	51.3	35.4	66.0	56.0	14.7	20.6	N	
0.16468	36.2	32.0	13.2	49.4	45.2	65.2	55.2	15.8	10.0	N	
0.16740	38.3	31.8	13.2	51.5	45.0	65.1	55.1	13.6	10.1	L	
0.17895	33.7	29.6	13.2	46.9	42.8	64.5	54.5	17.6	11.7	N	
0.17940	35.0	29.3	13.2	48.2	42.5	64.5	54.5	16.3	12.0	L	
0.42620	22.3	16.3	13.2	35.5	29.5	57.3	47.3	21.8	17.8	L	
0.42680	21.2	19.4	13.2	34.4	32.6	57.3	47.3	22.9	14.7	N	
13.56000	22.8	17.0	14.5	37.3	31.5	60.0	50.0	22.7	18.5	L	
13.56000	23.2	17.2	14.5	37.7	31.7	60.0	50.0	22.3	18.3	N	
15.98640	19.9	14.9	14.6	34.5	29.5	60.0	50.0	25.5	20.5	L	
15.92160	20.0	14.7	14.6	34.6	29.3	60.0	50.0	25.4	20.7	N	
27.12000	2.3	-2.3	15.1	17.4	12.8	60.0	50.0	42.6	37.2	L	
27.12000	2.8	-1.9	15.1	17.9	13.2	60.0	50.0	42.1	36.8	N	

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

Conducted emission

Cradle

DATA OF CONDUCTED EMISSION TEST

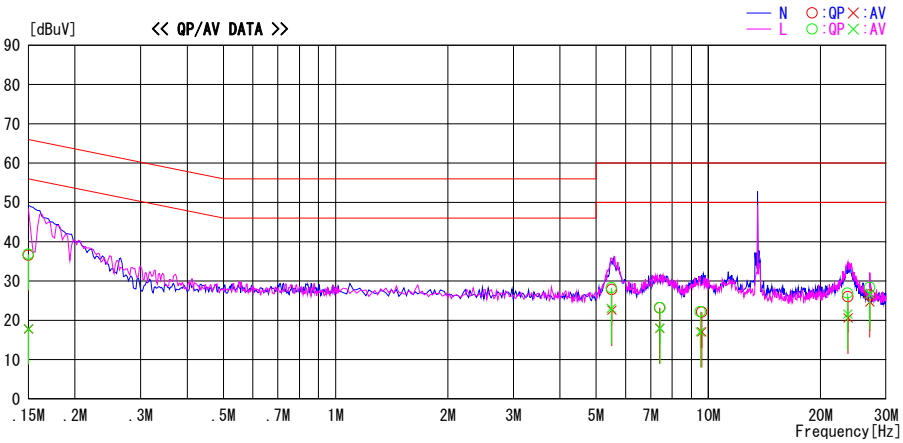
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/10/19

Report No. : 11502065H

Temp./Humi. : 24deg. C / 59% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, with Tag (with Antenna)

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	23.4	4.6	13.2	36.6	17.8	66.0	56.0	29.4	38.2	N	
0.15000	23.6	4.7	13.2	36.8	17.9	66.0	56.0	29.2	38.1	L	
5.49383	14.5	9.3	13.8	28.3	23.1	60.0	50.0	31.7	26.9	L	
5.51355	14.0	8.8	13.8	27.8	22.6	60.0	50.0	32.2	27.4	N	
7.40521	9.4	4.2	13.8	23.2	18.0	60.0	50.0	36.8	32.0	N	
7.41480	9.4	4.3	13.8	23.2	18.1	60.0	50.0	36.8	31.9	L	
9.51264	8.2	3.1	14.0	22.2	17.1	60.0	50.0	37.8	32.9	L	
9.60232	8.1	3.1	14.0	22.1	17.1	60.0	50.0	37.9	32.9	N	
23.64779	12.3	7.0	14.6	26.9	21.6	60.0	50.0	33.1	28.4	L	
23.69529	11.4	6.0	14.6	26.0	20.6	60.0	50.0	34.0	29.4	N	
27.11933	11.8	10.0	14.7	26.5	24.7	60.0	50.0	33.5	25.3	N	
27.11948	13.7	12.0	14.7	28.4	26.7	60.0	50.0	31.6	23.3	L	

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

Conducted emission
Cradle

DATA OF CONDUCTED EMISSION TEST

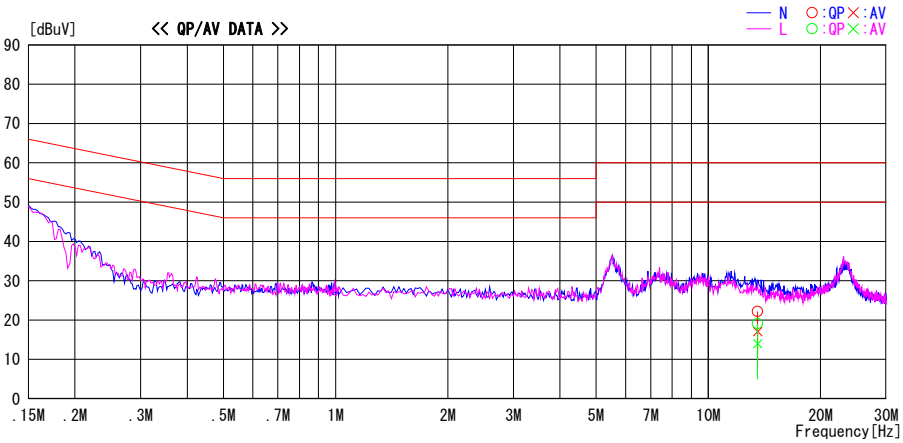
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/10/19

Report No. : 11502065H

Temp./Humi. : 24deg. C / 59% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz, without Tag (Antenna : 50 ohm terminated)

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
13.56000	8.0	2.9	14.2	22.2	17.1	60.0	50.0	37.8	32.9	N	
13.56000	4.9	-0.2	14.2	19.1	14.0	60.0	50.0	40.9	36.0	L	

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

Fundamental emission and Spectrum Mask

Tablet

DATA OF RADIATED EMISSION TEST

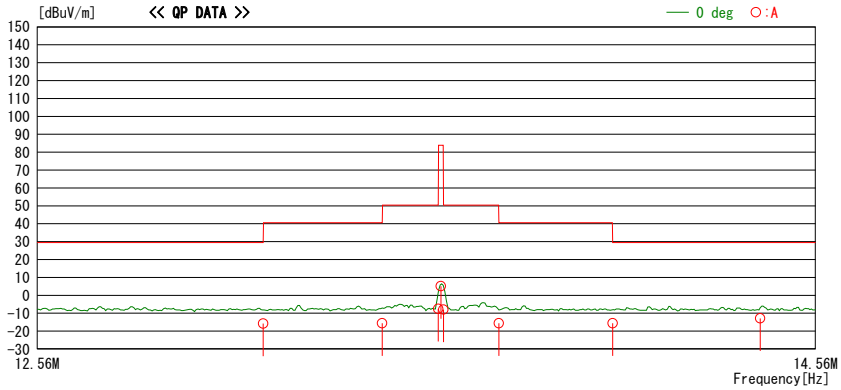
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/10/18

Report No. : 11502065H

Temp./ Humi. : 23deg. C / 63% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx 13.56MHz Worst-Axis Y With Tag

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
All other spurious emissions were less than 20dB for the limit.



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
13.11000	29.6	QP	19.6	-32.9	32.1	-15.8	29.5	45.3	0	A	359	
13.41000	29.8	QP	19.6	-32.9	32.1	-15.6	40.5	56.1	0	A	359	
13.55300	37.8	QP	19.6	-32.9	32.1	-7.6	50.4	58.0	0	A	359	
13.56000	50.5	QP	19.6	-32.9	32.1	5.1	83.9	78.8	0	A	359	
13.56700	37.4	QP	19.6	-32.9	32.1	-8.0	50.4	58.4	0	A	359	
13.71000	29.8	QP	19.6	-32.9	32.1	-15.6	40.5	56.1	0	A	359	
14.01000	29.7	QP	19.6	-32.9	32.1	-15.7	29.5	45.2	0	A	359	
14.40740	32.6	QP	19.6	-32.9	32.1	-12.8	29.5	42.3	0	A	359	

CHART: WITH FACTOR , ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN) - GAIN(AMP) + D-FACTOR

Result of the fundamental emission at 3 m without Distance factor

QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	13.56000	QP	50.5	19.6	7.1	32.1	-	45.1	-	-	Fundamental

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

Fundamental emission and Spectrum Mask

Cradle

DATA OF RADIATED EMISSION TEST

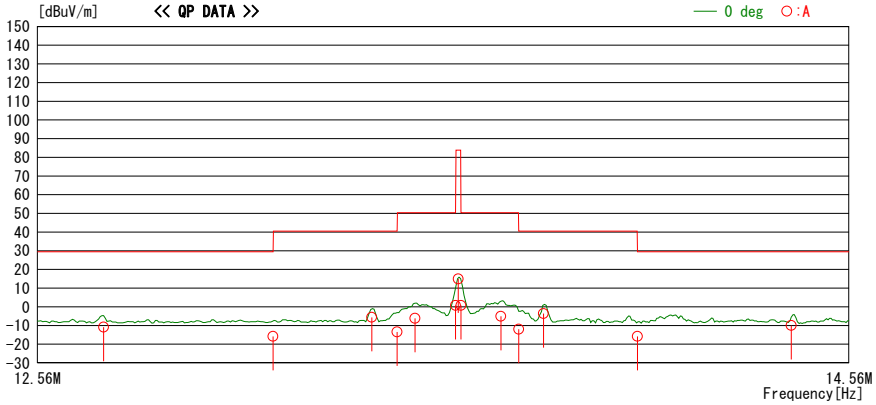
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/10/18

Report No. : 11502065H

Temp./ Humi. : 23deg. C / 63% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx 13.56MHz Worst-Axis Y With Tag Cradle

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
All other spurious emissions were less than 20dB for the limit.



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]	
12.71230	34.6	QP	19.6	-33.0	32.1	-10.9	29.5	40.4	0	A	359	
13.11000	29.6	QP	19.6	-32.9	32.1	-15.8	29.5	45.3	0	A	359	
13.34802	39.8	QP	19.6	-32.9	32.1	-5.6	40.5	46.1	0	A	359	
13.41000	32.0	QP	19.6	-32.9	32.1	-13.4	40.5	53.9	0	A	359	
13.45380	39.3	QP	19.6	-32.9	32.1	-6.1	50.4	56.5	0	A	359	
13.55300	46.2	QP	19.6	-32.9	32.1	0.8	50.4	49.6	0	A	359	
13.56000	60.4	QP	19.6	-32.9	32.1	15.0	83.9	68.9	0	A	359	
13.56700	46.1	QP	19.6	-32.9	32.1	0.7	50.4	49.7	0	A	359	
13.66562	40.4	QP	19.6	-32.9	32.1	-5.0	50.4	55.4	0	A	359	
13.71000	33.4	QP	19.6	-32.9	32.1	-12.0	40.5	52.5	0	A	359	
13.77198	41.8	QP	19.6	-32.9	32.1	-3.6	40.5	44.1	0	A	359	
14.01000	29.6	QP	19.6	-32.9	32.1	-15.8	29.5	45.3	0	A	359	
14.40740	35.4	QP	19.6	-32.9	32.1	-10.0	29.5	39.5	0	A	359	

CHART: WITH FACTOR , ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN) - GAIN(AMP) + D-FACTOR

Result of the fundamental emission at 3 m without Distance factor

QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	13.56000	QP	60.4	19.6	7.1	32.1	-	55.0	-	-	Fundamental

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

Spurious emission

Tablet

DATA OF RADIATED EMISSION TEST

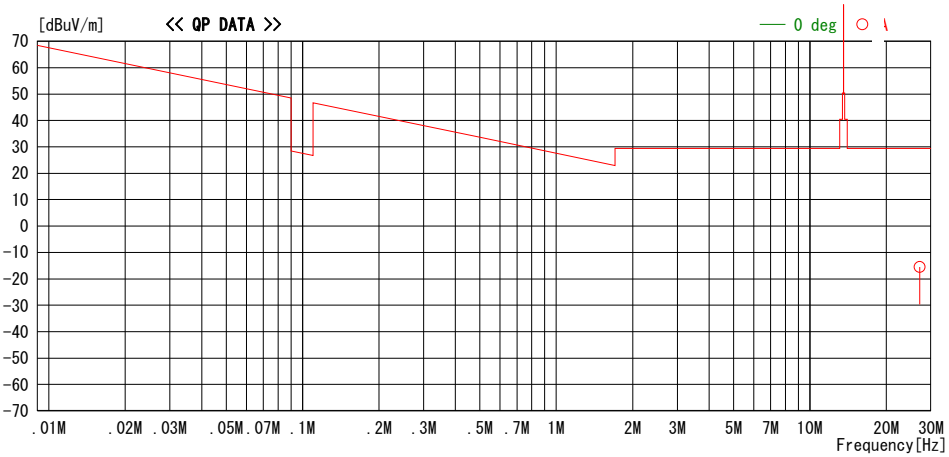
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/10/18

Report No. : 11502065H

Temp./ Humi. : 23deg. C / 63% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx 13.56MHz Worst-Axis Y With Tag

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
All other spurious emissions were less than 20dB for the limit.



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	28.9	QP	20.2	-32.5	32.1	-15.5	29.5	45.0	0	A	359	Floor Noise

CHART: WITH FACTOR , ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN) - GAIN(AMP) + D-FACTOR

Spurious emission

Tablet

DATA OF RADIATED EMISSION TEST

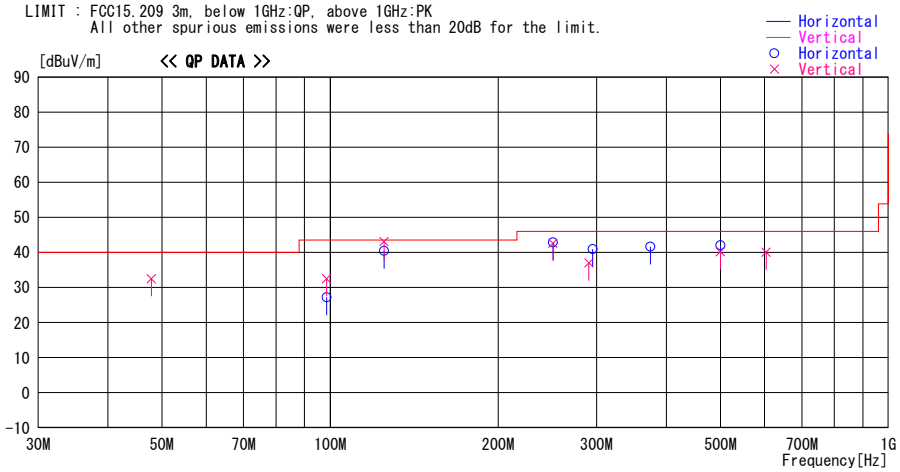
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2016/11/02

Report No. : 11502065H

Temp./Humi. : 24deg. C / 59% RH
Engineer : Ken Fujita

Mode / Remarks : Tx 13.56MHz, X-Axis, without Tag

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



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
47.850	42.2	QP	11.5	-21.2	32.5	213	100	Vert.	40.0	7.5	
98.567	43.4	QP	9.7	-20.6	32.5	47	100	Vert.	43.5	11.0	
98.567	38.1	QP	9.7	-20.6	27.2	73	300	Hori.	43.5	16.3	
124.917	50.0	QP	13.3	-20.2	43.1	11	100	Vert.	43.5	0.4	
124.917	47.3	QP	13.3	-20.2	40.4	128	314	Hori.	43.5	3.1	
250.667	48.9	QP	12.6	-18.7	42.8	356	114	Hori.	46.0	3.2	
250.667	48.7	QP	12.6	-18.7	42.6	354	100	Vert.	46.0	3.4	
290.667	42.1	QP	13.3	-18.4	37.0	112	100	Vert.	46.0	9.0	
295.167	46.0	QP	13.4	-18.5	40.9	16	112	Hori.	46.0	5.1	
374.667	44.8	QP	15.1	-18.3	41.6	57	100	Hori.	46.0	4.4	
500.002	42.9	QP	17.5	-18.4	42.0	0	194	Hori.	46.0	4.0	
500.002	41.1	QP	17.5	-18.4	40.2	284	102	Vert.	46.0	5.8	
604.000	39.1	QP	18.9	-17.9	40.1	11	100	Vert.	46.0	5.9	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-200MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE + ATTEN - GAIN(AMP))

Spurious emission

Cradle

DATA OF RADIATED EMISSION TEST

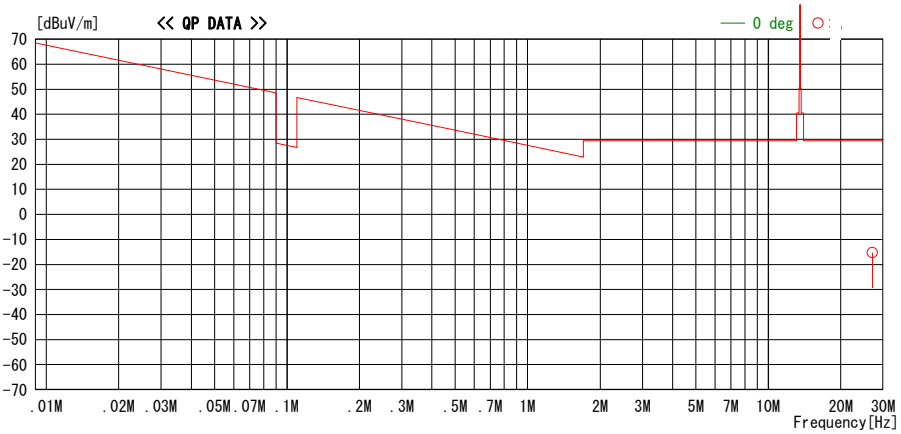
UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/10/18

Report No. : 11502065H

Temp./ Humi. : 23deg. C / 63% RH
Engineer : Tomoki Matsui

Mode / Remarks : Tx 13.56MHz Worst-Axis Y With Tag Cradle

LIMIT : FCC15_225_PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
All other spurious emissions were less than 20dB for the limit.



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
27.12000	29.2	QP	20.2	-32.5	32.1	-15.2	29.5	44.7	0	A	359	Floor Noise

CHART: WITH FACTOR , ANT TYPE: LOOP Except for the data below : adequate margin data below the limits.
CALCULATION : RESULT = READING + ANT FACTOR + LOSS(CABLE + ATTEN) - GAIN(AMP) + D-FACTOR

Spurious emission
Cradle

DATA OF RADIATED EMISSION TEST

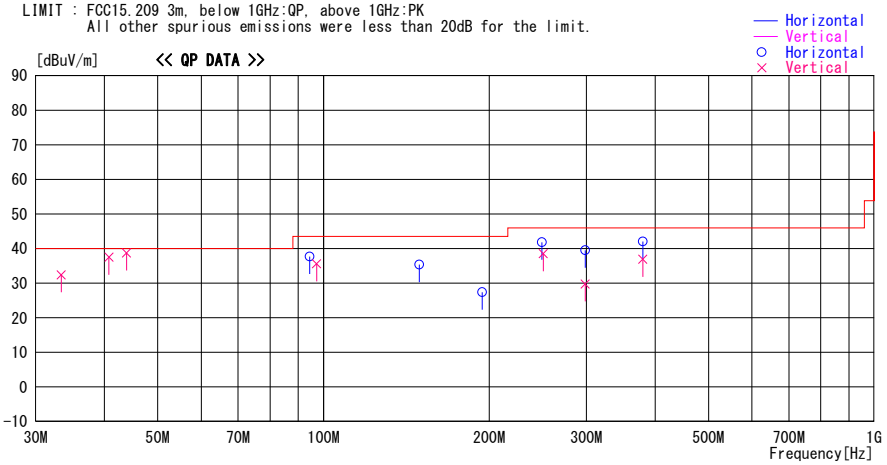
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2016/11/02

Report No. : 11502065H

Temp./Humi. : 24deg. C / 59% RH
Engineer : Ken Fujita

Mode / Remarks : Tx 13.56MHz, Hori:X Ver:Z With Tag

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



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
33.400	37.3	QP	16.5	-21.4	32.4	289	100	Vert.	40.0	7.6	
40.767	44.9	QP	13.9	-21.3	37.5	260	100	Vert.	40.0	2.5	
43.883	47.1	QP	12.8	-21.2	38.7	235	100	Vert.	40.0	1.3	
94.356	49.4	QP	8.9	-20.6	37.7	182	289	Hori.	43.5	5.8	
97.150	46.7	QP	9.5	-20.6	35.6	348	100	Vert.	43.5	7.9	
149.284	40.7	QP	14.7	-20.0	35.4	9	224	Hori.	43.5	8.1	
194.335	30.1	QP	16.6	-19.3	27.4	359	400	Hori.	43.5	16.1	
249.333	47.9	QP	12.6	-18.7	41.8	230	100	Hori.	46.0	4.2	
250.667	44.6	QP	12.6	-18.7	38.5	296	100	Vert.	46.0	7.5	
298.667	34.8	QP	13.4	-18.4	29.8	306	100	Vert.	46.0	16.2	
298.667	44.5	QP	13.4	-18.4	39.5	83	107	Hori.	46.0	6.5	
380.001	45.2	QP	15.2	-18.4	42.0	327	100	Hori.	46.0	4.0	
380.001	40.1	QP	15.2	-18.4	36.9	61	165	Vert.	46.0	9.1	

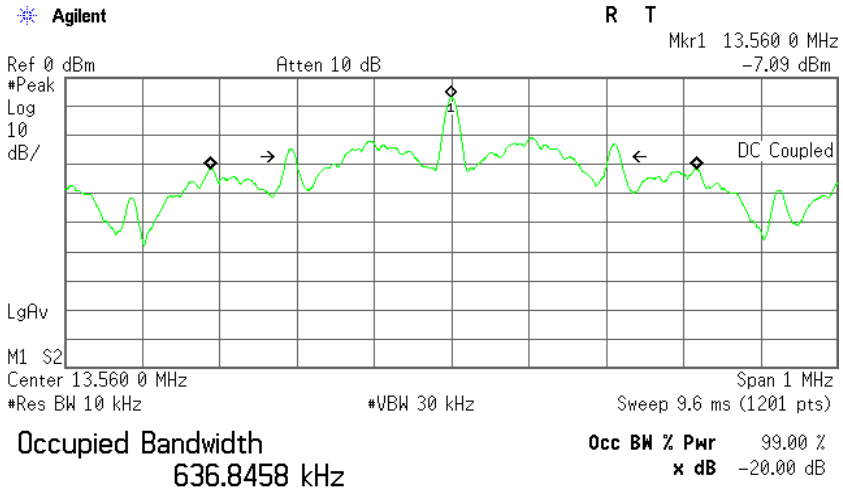
CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-200MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE + ATTEN - GAIN(AMP))

20dB Bandwidth and 99% Occupied Bandwidth

Tablet

Test place	Ise EMC Lab. No.11 measurement room
Report No.	11502065H
Date	12/15/2016
Temperature/ Humidity	21 deg. C / 32 % RH
Engineer	Tomoki Matsui
Mode	Tx Mod on with Tag

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	436.75	636.85



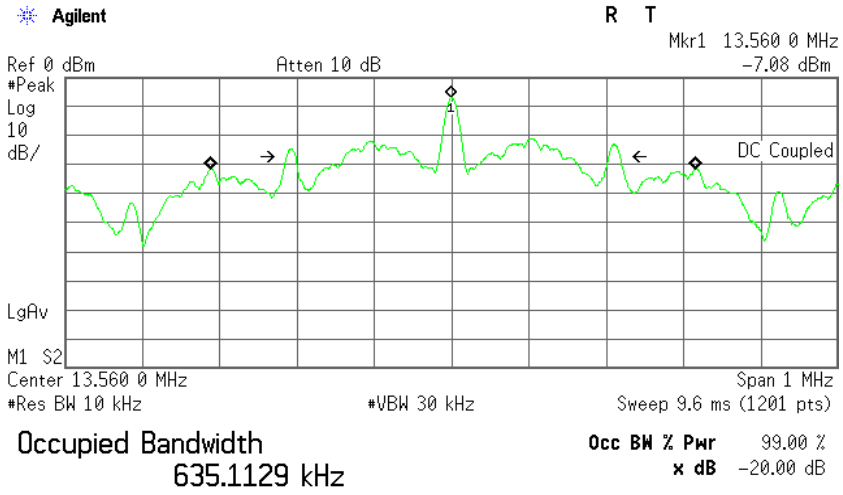
Transmit Freq Error 2.115 kHz
x dB Bandwidth 436.753 kHz

20dB Bandwidth and 99% Occupied Bandwidth

Cradle

Test place	Ise EMC Lab. No.11 measurement room
Report No.	11502065H
Date	12/15/2016
Temperature/ Humidity	21 deg. C / 32 % RH
Engineer	Tomoki Matsui
Mode	Tx Mod on with Tag

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	436.75	635.11



Frequency Tolerance

Test place	Ise EMC Lab. No.11 measurement room
Report No.	11502065H
Date	10/20/2016
Temperature/ Humidity	24 deg. C / 51 % RH
Engineer	Tomoki Matsui
Mode	Tx Mod on with Tag

Test condition		Tested	Measured	Frequency	Result		Limit
Temp.	Voltage	timing	frequency	error			
[deg. C]	[V]		[MHz]	[MHz]	[%]	[ppm]	[+/- %]
50	3.3	Power on	13.559948	-0.000052	-0.00038	-3.8	0.01
		+ 2 min.	13.559926	-0.000074	-0.00055	-5.5	0.01
		+ 5 min.	13.559955	-0.000045	-0.00033	-3.3	0.01
		+ 10 min.	13.559896	-0.000104	-0.00077	-7.7	0.01
40	3.3	Power on	13.559954	-0.000046	-0.00034	-3.4	0.01
		+ 2 min.	13.559920	-0.000080	-0.00059	-5.9	0.01
		+ 5 min.	13.559945	-0.000055	-0.00041	-4.1	0.01
		+ 10 min.	13.559913	-0.000087	-0.00064	-6.4	0.01
30	3.3	Power on	13.559949	-0.000051	-0.00038	-3.8	0.01
		+ 2 min.	13.559958	-0.000042	-0.00031	-3.1	0.01
		+ 5 min.	13.559924	-0.000076	-0.00056	-5.6	0.01
		+ 10 min.	13.559971	-0.000029	-0.00021	-2.1	0.01
20	3.3	Power on	13.560046	0.000046	0.00034	3.4	0.01
		+ 2 min.	13.559927	-0.000073	-0.00054	-5.4	0.01
		+ 5 min.	13.560041	0.000041	0.00030	3.0	0.01
		+ 10 min.	13.559913	-0.000087	-0.00064	-6.4	0.01
20	2.805	Power on	13.559996	-0.000004	-0.00003	-0.3	0.01
	(3.3V -15%)	+ 2 min.	13.560143	0.000143	0.00105	10.5	0.01
		+ 5 min.	13.559929	-0.000071	-0.00052	-5.2	0.01
		+ 10 min.	13.560017	0.000017	0.00013	1.3	0.01
20	3.795	Power on	13.559975	-0.000025	-0.00018	-1.8	0.01
	(3.3V +15%)	+ 2 min.	13.559932	-0.000068	-0.00050	-5.0	0.01
		+ 5 min.	13.560026	0.000026	0.00019	1.9	0.01
		+ 10 min.	13.559987	-0.000013	-0.00010	-1.0	0.01
10	3.3	Power on	13.560023	0.000023	0.00017	1.7	0.01
		+ 2 min.	13.560055	0.000055	0.00041	4.1	0.01
		+ 5 min.	13.559999	-0.000001	-0.00001	-0.1	0.01
		+ 10 min.	13.560058	0.000058	0.00043	4.3	0.01
0	3.3	Power on	13.560051	0.000051	0.00038	3.8	0.01
		+ 2 min.	13.560028	0.000028	0.00021	2.1	0.01
		+ 5 min.	13.560037	0.000037	0.00027	2.7	0.01
		+ 10 min.	13.560031	0.000031	0.00023	2.3	0.01
-10	3.3	Power on	13.560046	0.000046	0.00034	3.4	0.01
		+ 2 min.	13.560027	0.000027	0.00020	2.0	0.01
		+ 5 min.	13.560084	0.000084	0.00062	6.2	0.01
		+ 10 min.	13.559996	-0.000004	-0.00003	-0.3	0.01
-20	3.3	Power on	13.560038	0.000038	0.00028	2.8	0.01
		+ 2 min.	13.559994	-0.000006	-0.00004	-0.4	0.01
		+ 5 min.	13.560061	0.000061	0.00045	4.5	0.01
		+ 10 min.	13.560098	0.000098	0.00072	7.2	0.01

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

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

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE	2016/07/11 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2016/01/12 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(3m)/ sucoform141-PE(1m)/ 421-010(1.5m)/ RFM-E321(Switcher)	-/00640	CE	2016/07/26 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2016/01/14 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2016/08/02 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2016/01/21 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2016/11/10 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2016/10/21 * 12
MBA-08	Biconical Antenna	Schwarzbeck	VHA9103B	08031	RE	2016/09/29 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2016/01/30 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2016/02/08 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2015/11/10 * 12 *1)
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2016/09/13 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2016/08/23 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2016/10/14 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/ 5D-2W(5m)/ 5D-2W(0.8m)/ 5D-2W(1m)	-	RE	2016/02/08 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2016/06/20 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2016/03/18 * 12
MRENT-130	Spectrum Analyzer	Agilent	E4440A	MY46187750	FT	2016/06/03 * 12
MCH-06	Temperature and Humidity Chamber	Tabai Espec	PL-1KT	14007630	FT	2016/04/18 * 12
MLPA-07	Loop Antenna	UL Japan	-	-	FT	Pre Check
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	FT	2015/12/08 * 12
MMM-17	DIGIITAL HiTESTER	Hioki	3805	070900530	FT	2016/01/13 * 12

***1) This test equipment was used for the tests before the expiration date of the calibration.**

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