



# RADIO TEST REPORT

**Test Report No.: 11251380S-B-R3**

**Applicant** : Nintendo Co., Ltd.  
**Type of Equipment** : Wireless Game Device  
**Model No.** : HAC-016  
**FCC ID** : BKEHAC016  
**Test regulation** : FCC Part15 Subpart C: 2016  
**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 the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
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 11251380S-B-R2. 11251380S-B-R2 is replaced with this report.

**Date of test:** May 30 to November 25, 2016

**Representative test engineer:**

  
\_\_\_\_\_

Hikaru Shirasawa  
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".

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13-EM-F0429



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## **SECTION 1: Customer information**

Company Name : Nintendo Co., Ltd.  
Address : 11-1 Hokotate-cho, Kamitoba, Minami-ku, Kyoto 601-8501, Japan  
Telephone Number : +81-75-662-9600  
Facsimile Number : +81-75-662-9624  
Contact Person : Kazuya Kuramoto

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

### **2.1 Identification of E.U.T.**

Type of Equipment : Wireless Game Device  
Model No. : HAC-016  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : Vbat: DC 3.2 V to DC 4.5 V (Typical: DC 3.7 V)  
Vin: DC 5.0 V  
Receipt Date of Sample : April 20, 2016  
Country of Mass-production : China  
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: HAC-016 (referred to as the EUT in this report) is a Wireless Game Device.

### **General Specification**

Clock frequency(ies) in the system : Bluetooth: 24 MHz, NFC: 27.12 MHz

### **Radio Specification**

#### **[Bluetooth] \*1)**

Radio Type : Transceiver  
Frequency of Operation : 2402 MHz - 2480 MHz  
Modulation : FHSS  
Power Supply (radio part input) : DC 1.8 V  
Antenna type : Inverted-F Antenna  
Antenna Gain : 1.85 dBi  
Operation temperature : +5 deg.C to +35 deg.C

#### **[NFC]**

Radio Type : Transceiver  
Frequency of Operation : 13.56 MHz  
Modulation : ASK  
Power Supply (radio part input) : DC 1.8 V  
Antenna type : Loop Antenna  
Operation temperature : +5 deg.C to +35 deg.C

\*1) Refer to test report no. 11251380S-A.

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## **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 47 CFR Part 15 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 bands 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.

### **3.2 Procedures & Results**

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 8.8	FCC 15.207 ----- <IC> RSS-Gen 8.8	-	N/A	9.8 dB (13.56 MHz, AV, L1)	Complied
Electric field strength of Fundamental emission	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 6.4, 6.12	FCC 15.225 (a) ----- <IC> RSS-210 B.6	Radiated	N/A	61.0 dB (Vertical, Type-DA)	Complied
Electric field strength of Spurious emission (within the 13.110-14.010 MHz band)	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 6.4, 6.13	FCC 15.225 ----- (b)(c) <IC> RSS-210 B.6	Radiated	N/A	41.0 dB (13.553 MHz, Vertical, Type-TX)	Complied
Electric field strength of Spurious emission (outside of the 13.110-14.010 MHz band)	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 6.4, 6.13	FCC 15.209 ----- FCC 15.225 (d) <IC> RSS-210 B.6 *1)	Radiated	N/A	4.0 dB (40.68 MHz, Vertical, Type-TX)	Complied
20dB bandwidth	ANSI C63.10:2013 6 Standard test methods <IC> -	FCC 15.215 (c) ----- <IC> -	Radiated	N/A	-	-
Frequency tolerance	ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.11, 8.11	FCC 15.225 (e) ----- <IC> RSS-210 B.6	Radiated	N/A	-	Complied
Occupied Bandwidth (99 %)	<IC> RSS-Gen 6.6	-	Radiated	N/A	-	-

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

\*1) 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.

#### **FCC Part 15.31 (e)**

The EUT is supplied the power from battery or host device. In either method, the EUT provides stable voltage (DC 1.8 V) constantly to RF Module regardless of input voltage. In the case of battery method, the test was performed with the full-charged battery. Therefore, the EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

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

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### 3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99 %)	ANSI C63.10:2013 6.Standard test methods RSS-Gen 6.6	RSS-Gen 4.6.1	Conducted	-	-

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

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

### 3.4 Uncertainty

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

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Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.1 dB	2.1 dB	2.6 dB	2.2 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	2.7 dB	2.7 dB	3.1 dB	-
	30 MHz-300 MHz	4.4 dB	4.4 dB	4.6 dB	-
	300 MHz-1 GHz	5.6 dB	5.5 dB	5.3 dB	-
Radiated emission (Measurement distance: 1 m)	1 GHz-13 GHz	5.2 dB	5.2 dB	5.2 dB	-
	13 GHz-18 GHz	4.9 dB	4.9 dB	4.9 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	0.76 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.79 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.74 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.08 dB
Spurious emission (Conducted) below 1GHz	1.5 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.4 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.5 dB
Bandwidth Measurement	0.66 %
Duty cycle and Time Measurement	0.012 %

#### Conducted emission test

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

#### Radiated emission test

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

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### 3.5 Test location

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JAB Accreditation No. : RTL02610

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

### 3.6 Test setup, Data of EMI & Test instruments

Refer to APPENDIX.

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## 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
All items except for Transmitter carrier output levels	Transmitting (ASK)	13.56 MHz
Transmitter carrier output levels	Transmitting Unmodulated	13.56 MHz

Software for testing: NFC RF TEST.exe version 0.2.0.0

Power setting: Fixed.

The carrier level and noise levels were confirmed with and without Tag, and the test was made with the condition that has the maximum noise.

Combinations of the worst case:

Radiated emission (Carrier)	Radiated emission (Below 30MHz)	Radiated emission (Above 30MHz)
With Tag (Type-DA)	With Tag (Type-TX)	With Tag (Type-TX)

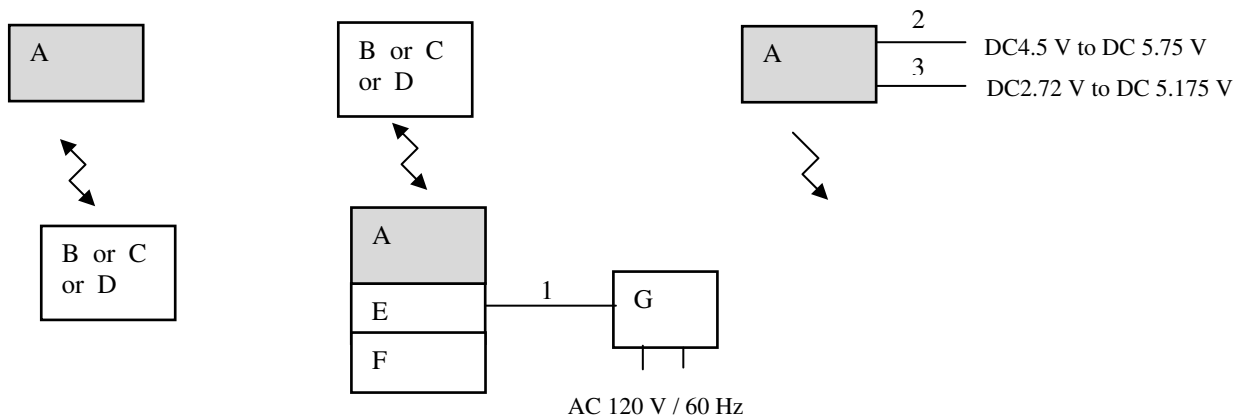
**Justification:** The system was configured in typical fashion (as customer would normally use it) for testing.

### 4.2 Configuration of tested system

(1) For radiated emissions tests, Bandwidth \*

(2) For conducted emissions tests

(3) For Frequency tolerance



\* Pre-check measurement was performed with the EUT (supplied from the host device, and battery operation). It was confirmed that there was no difference.

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### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Game Device	HAC-016	*1)	Nintendo Co., Ltd.	EUT
B	Tag	NVL-001	-	Nintendo Co., Ltd.	Type A
C	Tag	-	-	-	Type B
D	Tag	-	-	-	Type F
E	Grip(Fixing Jig)	-	-	Nintendo Co., Ltd.	-
F	Wireless Game Device	HAC-015	XBL0000002524	Nintendo Co., Ltd.	-
G	AC adapter	HAC-002	MAIN JPN No.1	Nintendo Co., Ltd.	-

\*1)

	Frequency Tolerance, Bandwidth	Radiated emission tests
Serial number	XCL0000002577 (Type-DA), XCL0000000361 (Type-TX)	XCL0000000861 (Type-DA) XCL0000002579 (Type-TX)
	Conducted emission tests	Conducted emission tests (carrier): Antenna terminated
Serial number	XCL0000000861 (Type-DA)	XCL0000000929 (Type-DA)

\*The EUT for final test was selected based on following preliminary test.

- Conducted Emission: Representative mode.

### Accessory and model differences

The difference between Type-DA and Type-TX is as following table.

The two crystals and 1.8 V LDO are compatible and are electrically identical having same radio parameters.

So, for the Conducted emission tests the E.U.T. was selected worse Type by preliminary tests.

	Type-DA	Type-TX
Crystal (X1)	DSX211SH	7R24080002
1.8 V LDO (U37)	LD39020DTPU18R	RP202K181D

### List of cables used

No.	Cable Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB cable	1.5	Shielded	Shielded	-
2	DC cable	1.5	Unshielded	Unshielded	-
3	DC cable	1.5	Unshielded	Unshielded	-

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## **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 2.0 m, raised 80 cm 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 EUT, including peripherals 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 and excess AC cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment. 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  
EUT operation mode : Refer to SECTION 4.1

### **5.4 Test procedure**

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT via AC adapter within a Shielded room. The EUT via AC adapter 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, an average detector. The conducted emission measurements were made with the following detection of the test receiver.

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

### **5.5 Results**

Summary of the test results : Pass  
Refer to APPENDIX 1

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## **SECTION 6: Radiated 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 polystyrene platform of nominal size, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane. That has very low permittivity.

Photographs of the set up are shown in APPENDIX 3.

### **6.3 Test procedure**

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

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 (Refer to Figure 2)

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. 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	10 kHz	9 kHz	120 kHz
Distance factor *1)	-80 dB	-80 dB	-80 dB	-40 dB	-
Measuring antenna	Loop antenna				Biconical (30 MHz - 299.99 MHz) Logperiodic (300 MHz - 1 GHz)

\*1) FCC 15.31 (f)(2) (9kHz-30MHz)

Distance Factor:  $40 \times \log(3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

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

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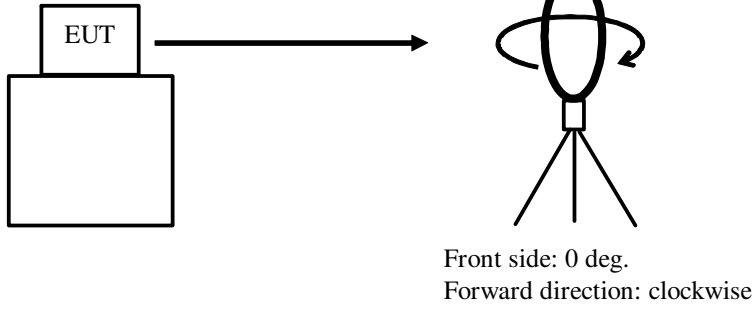
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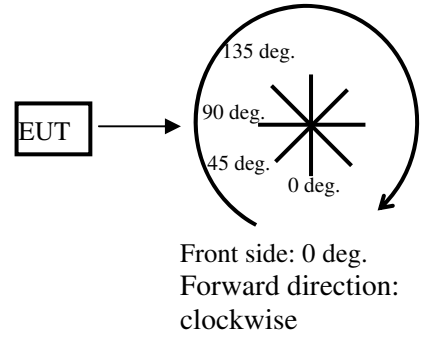
Facsimile : +81 463 50 6401

Figure 1: Direction of the Loop Antenna

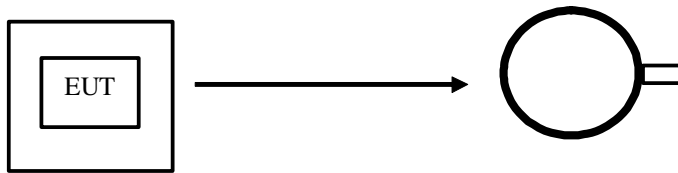
*Side View (Vertical)*



*Top View (Vertical)*



*Top View (Horizontal)*



Antenna was not rotated.

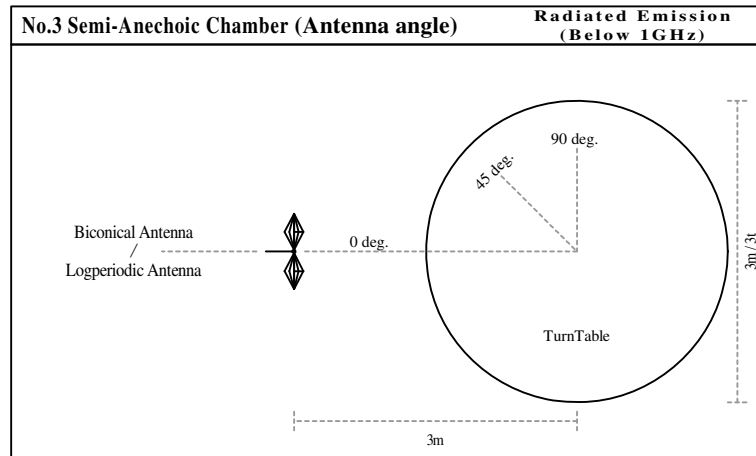


Figure 2. Antenna angle

#### 6.4 Results

Summary of the test results : Pass  
Refer to APPENDIX 1

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

#### Test procedure

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

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	20 MHz	10 kHz	30 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display 20 dB Bandwidth	1 % of Span	Three times of RBW	Auto (Single)	Sample	Max Hold *1)	Spectrum Analyzer

\*1) The measurement was performed with Max Hold since the duty cycle was not 100%.

Summary of the test results: Pass  
Refer to APPENDIX 1

### SECTION 8: Frequency Tolerance

#### Test procedure

The test was measured with a frequency counter 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.

Summary of the test results: Pass  
Refer to APPENDIX 1

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## **Contents of APPENDIXES**

### **APPENDIX 1: Data of Radio tests**

Conducted Emission  
Radiated Emission  
    Fundamental and Outside the Allocated bands  
    Spurious  
-20 dB Bandwidth and Occupied Bandwidth  
Frequency Tolerance

### **APPENDIX 2: Test instruments**

Test instruments

### **APPENDIX 3: Photographs of test setup**

Conducted emission  
Radiated emission  
Pre-check of worst position

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**APPENDIX 1: Data of Radio test**

**DATA OF CONDUCTED EMISSION TEST**

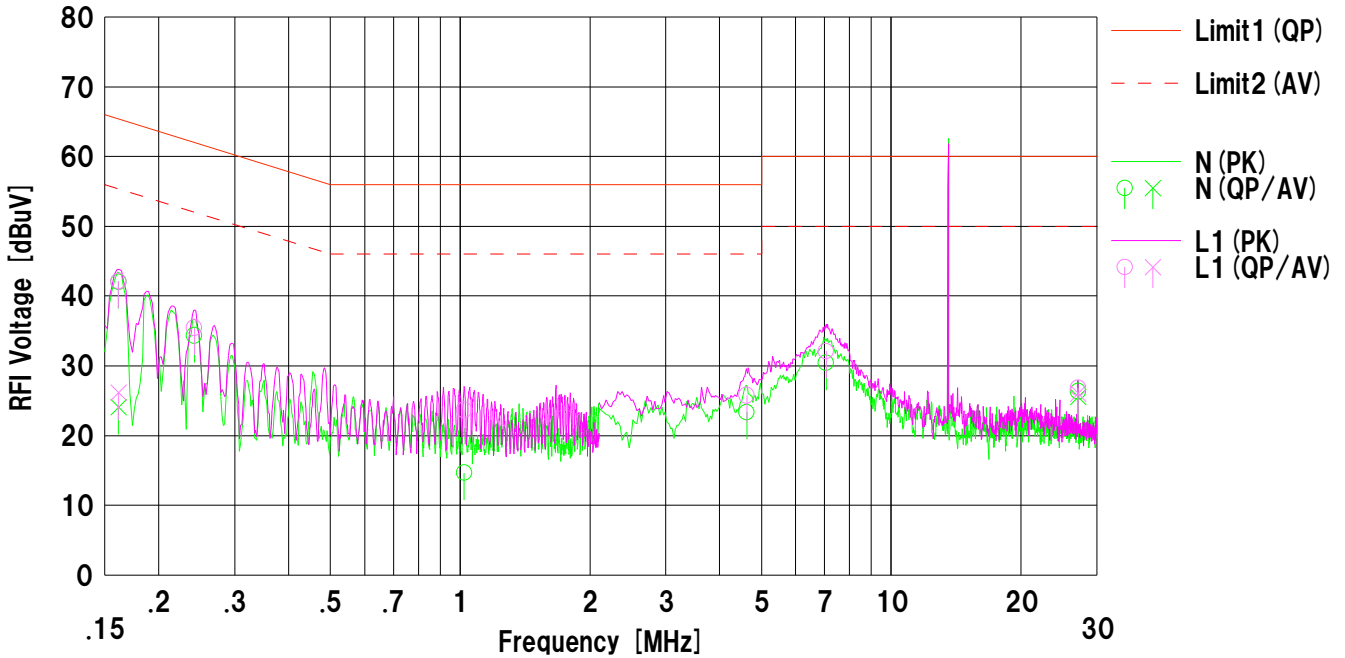
UL Japan,Inc. Shonan EMC Lab. No.2 Shielded Room  
Date : 2016/10/03

Serial No. : XCL0000000861  
Remarks : Type:B with Card test mode

Mode : NFC Communication (type B)  
Order No. : 11251380S  
Power : AC 120 V / 60 Hz (AC adapter input)  
Temp./Humi. : 24 deg.C / 68 %RH

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

Engineer : Makoto Hosaka



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	0.16126	29.50	11.50	12.55	42.05	24.05	65.40	55.40	23.3	31.3	N	
2	0.24173	21.80	---	12.56	34.36	---	62.04	52.04	27.6	---	N	
3	1.02255	2.00	---	12.66	14.66	---	56.00	46.00	41.3	---	N	
4	4.62530	10.30	---	13.07	23.37	---	56.00	46.00	32.6	---	N	
5	7.06126	17.00	---	13.40	30.40	---	60.00	50.00	29.6	---	N	
6	27.12000	11.60	10.80	14.75	26.35	25.55	60.00	50.00	33.6	24.4	N	
7	0.16126	29.60	13.60	12.55	42.15	26.15	65.40	55.40	23.2	29.2	L1	
8	0.24173	22.90	---	12.56	35.46	---	62.04	52.04	26.5	---	L1	
9	1.02255	11.00	---	12.66	23.66	---	56.00	46.00	32.3	---	L1	
10	4.62450	12.70	---	13.07	25.77	---	56.00	46.00	30.2	---	L1	
11	7.06126	18.70	---	13.40	32.10	---	60.00	50.00	27.9	---	L1	
12	27.12000	12.10	11.30	14.75	26.85	26.05	60.00	50.00	33.1	23.9	L1	

# DATA OF CONDUCTED EMISSION TEST

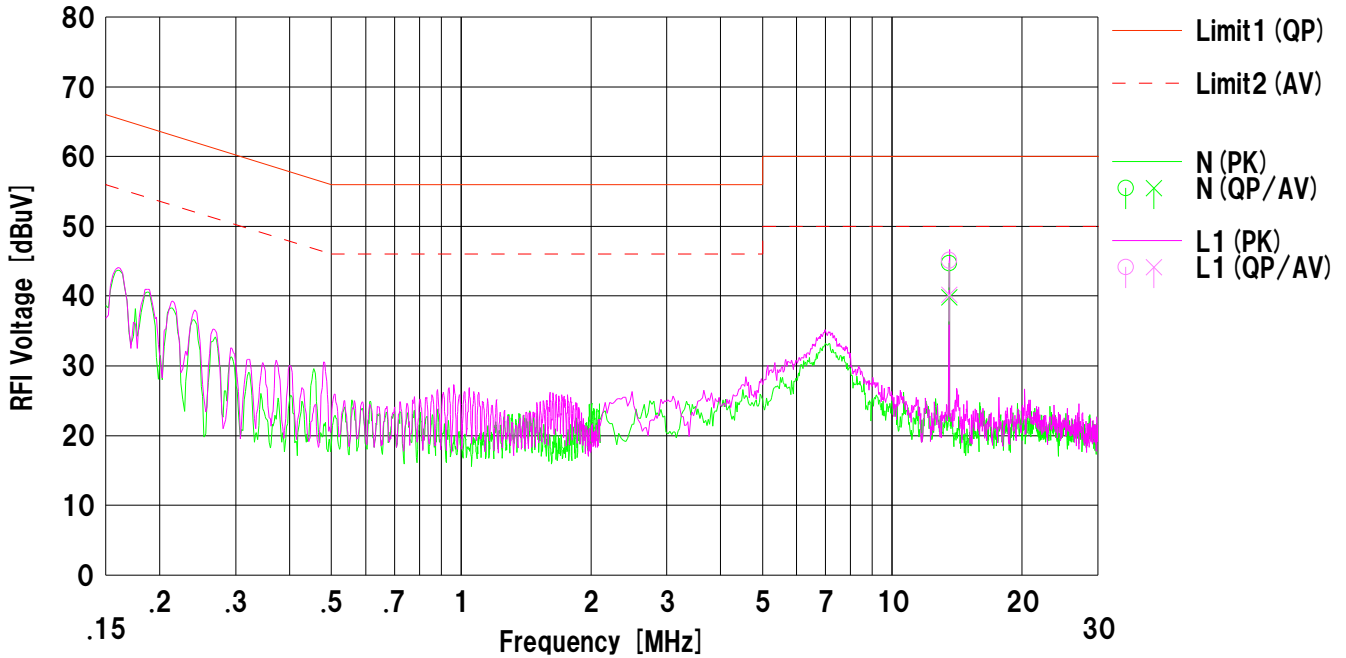
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room  
Date : 2016/10/03

Serial No. : XCL0000000929  
Remarks : Antenna: Terminated

Mode : NFC Communication (type B)  
Order No. : 11251380S  
Power : AC 120 V / 60 Hz (AC adapter input)  
Temp./Humi. : 24 deg.C / 68 %RH

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

Engineer : Makoto Hosaka



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	13.56000	30.50	25.60	14.20	44.70	39.80	60.00	50.00	15.3	10.2	N	
2	13.56000	30.90	26.00	14.20	45.10	40.20	60.00	50.00	14.9	9.8	L1	



## 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.3 Semi Anechoic Chamber

Sample No.: XCL0000000861  
Power: DC 3.7 V(Vbat)  
Mode: Transmitting 13.56MHz

Regulation: FCC Part15 Subpart C 15.225  
Test Distance: 3m  
Date: May 30, 2016  
Temperature: 23 deg.C  
Humidity: 53 %RH  
ENGINEER: Shinichi Takano

Remarks: : NFC type B, with Tag (axis: H: Y / V: 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	59.8	69.7	18.4	6.7	31.8	-40.0	13.0	22.9	83.9	70.9	61.0

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

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

Limits (30m)

•13.553MHz to 13.567MHz : 83.9dBuV/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	29.8	29.9	18.4	6.7	31.8	-40.0	-17.0	-16.9	29.5	46.5	46.4
2	13.410	29.9	30.0	18.4	6.7	31.8	-40.0	-16.9	-16.82	40.5	57.4	57.3
3	13.553	45.3	54.5	18.4	6.7	31.8	-40.0	-1.5	7.7	50.4	51.9	42.7
4	13.567	46.2	55.4	18.4	6.7	31.8	-40.0	-0.6	8.6	50.4	51.0	41.8
5	13.710	29.9	29.9	18.4	6.7	31.8	-40.0	-16.9	-16.92	40.5	57.4	57.4
6	14.010	29.8	30.0	18.4	6.7	31.8	-40.0	-17.0	-16.84	29.5	46.5	46.3

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±7kHz:13.553MHz to 13.567MHz

•Fc±150kHz:13.410MHz to 13.710MHz

•Fc±450kHz:13.110MHz to 14.010MHz

Fc = 13.56MHz

Limits (30m)

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

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

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

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## 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.3 Semi Anechoic Chamber

Sample No.: XCL0000002579  
Power: DC 3.7 V(Vbat)  
Mode: Transmitting 13.56MHz

Regulation: FCC Part15 Subpart C 15.225  
Test Distance: 3m  
Date: May 31, 2016  
Temperature: 24 deg.C  
Humidity: 58 %RH  
ENGINEER: Shinichi Takano

Remarks: : NFC type B, with Tag (axis: H: Y / V: 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	60.2	69.4	18.4	6.7	31.8	-40.0	13.4	22.6	83.9	70.5	61.3

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

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

Limits (30m)

•13.553MHz to 13.567MHz : 83.9dBuV/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	30.1	30.0	18.4	6.7	31.8	-40.0	-16.7	-16.8	29.5	46.2	46.3
2	13.410	30.0	30.1	18.4	6.7	31.8	-40.0	-16.8	-16.66	40.5	57.3	57.2
3	13.553	47.2	56.2	18.4	6.7	31.8	-40.0	0.4	9.4	50.4	50.0	41.0
4	13.567	44.8	53.7	18.4	6.7	31.8	-40.0	-2.0	6.9	50.4	52.4	43.5
5	13.710	30.2	30.1	18.4	6.7	31.8	-40.0	-16.6	-16.72	40.5	57.1	57.2
6	14.010	30.1	30.2	18.4	6.7	31.8	-40.0	-16.7	-16.64	29.5	46.2	46.1

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±7kHz:13.553MHz to 13.567MHz

•Fc±150kHz:13.410MHz to 13.710MHz

•Fc±450kHz:13.110MHz to 14.010MHz

Fc = 13.56MHz

Limits (30m)

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

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

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

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## Radiated Emission

UL Japan, Inc.  
Shonan EMC Lab. No.3 Semi Anechoic Chamber

Sample No.: XCL0000000861  
Power: DC 3.7 V(Vbat)  
Mode: Transmitting 13.56MHz  
EUT axis: Below 30MHz( Horizontal Y-axis, Vertical Z-axis), NFC type B, with Tag  
Above 30MHz( Horizontal: Z-axis, Vertical: Z-axis), NFC type B, with Tag

Regulation: FCC Part15 Subpart C 15.225  
Test Distance: 3m  
Date: May 31, 2016  
Temperature: 24 deg.C  
Humidity: 58 %RH  
ENGINEER: Shinichi Takano

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.	27.12	QP	29.7	18.6	7.0	31.8	-40.0	-16.5	29.5	46.0	-	359	* Limit: 30m
Hori.	40.680	QP	40.7	13.7	7.3	31.8	0.0	29.9	40.0	10.1	254	226	
Hori.	54.240	QP	27.4	9.1	7.4	31.8	0.0	12.1	40.0	27.9	305	259	
Hori.	67.800	QP	27.2	6.3	7.4	31.8	0.0	9.1	40.0	30.9	270	57	
Hori.	81.360	QP	25.9	6.1	8.4	31.8	0.0	8.6	40.0	31.4	204	26	
Hori.	94.920	QP	35.4	8.8	8.3	31.8	0.0	20.7	43.5	22.8	175	37	
Hori.	108.480	QP	23.4	11.0	8.1	31.8	0.0	10.7	43.5	32.8	300	292	
Hori.	122.040	QP	28.8	12.8	8.2	31.8	0.0	18.0	43.5	25.5	400	42	
Hori.	135.600	QP	23.2	13.8	8.5	31.8	0.0	13.7	43.5	29.8	200	243	
Hori.	840.720	QP	30.3	21.5	9.5	31.6	0.0	29.7	46.0	16.3	100	130	
Vert.	27.12	QP	30.5	18.6	7.0	31.8	-40.0	-15.8	29.5	45.3	-	359	* Limit: 30m
Vert.	40.680	QP	46.6	13.7	7.3	31.8	0.0	35.8	40.0	<b>4.2</b>	100	123	
Vert.	54.240	QP	32.0	9.1	7.4	31.8	0.0	16.7	40.0	23.3	100	318	
Vert.	67.800	QP	29.9	6.3	7.4	31.8	0.0	11.8	40.0	28.2	100	144	
Vert.	81.360	QP	29.3	6.1	8.4	31.8	0.0	12.0	40.0	28.0	100	304	
Vert.	94.92	QP	44.6	8.8	8.3	31.8	0.0	29.9	43.5	13.6	100	127	
Vert.	108.48	QP	25.7	11.0	8.1	31.8	0.0	13.0	43.5	30.5	100	318	
Vert.	122.04	QP	36.5	12.8	8.2	31.8	0.0	25.7	43.5	17.8	100	134	
Vert.	135.60	QP	27.2	13.8	8.5	31.8	0.0	17.7	43.5	25.8	100	322	
Vert.	447.48	QP	32.2	16.7	7.5	31.9	0.0	24.5	46.0	21.5	119	214	

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).

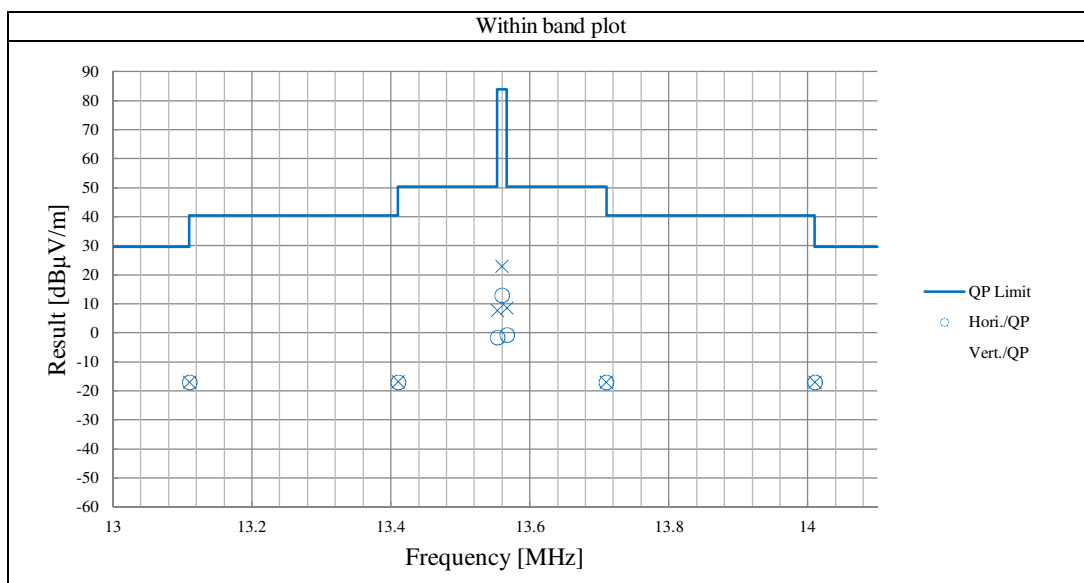
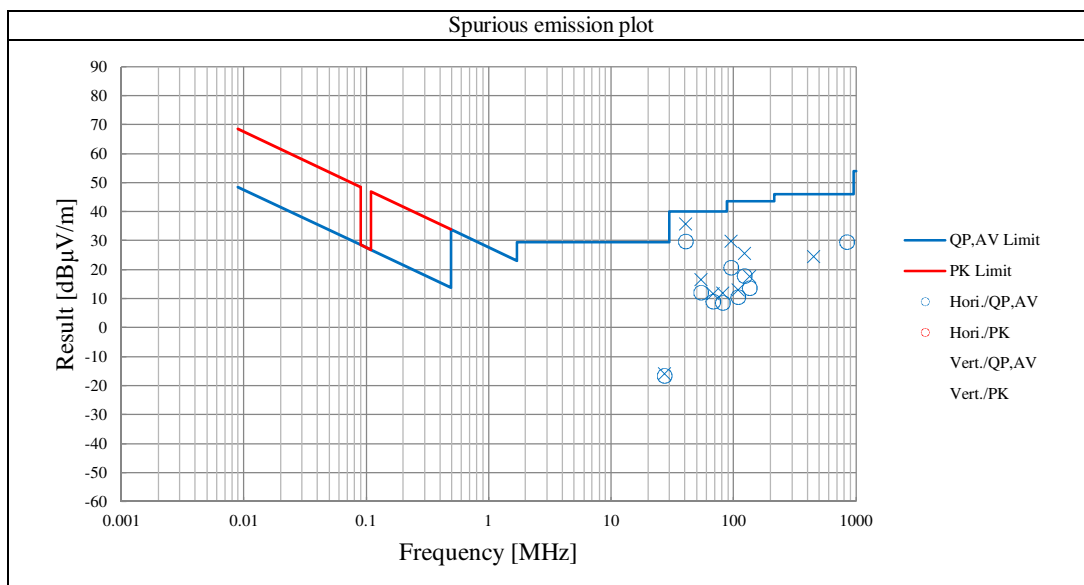
\* Carrier level (Result at 3m): Hor= 53dBuV/m, Ver= 62.9 dBuV/m

## Radiated Emission (Worst mode plot)

UL Japan, Inc.  
Shonan EMC Lab. No.3 Semi Anechoic Chamber

Sample No.: XCL0000000861  
 Power: DC 3.7 V(Vbat)  
 Mode: Transmitting 13.56MHz  
 EUT axis: Below 30MHz( Horizontal Y-axis, Vertical Z-axis), NFC type B, with Tag  
 Above 30MHz( Horizontal: Z-axis, Vertical: Z-axis), NFC type B, with Tag  
 Remarks: These plots data contains sufficient number to show the trend of characteristic features for EUT.

Regulation: FCC Part15 Subpart C 15.225  
 Test Distance: 3m  
 Date: May 31, 2016  
 Temperature: 24 deg.C  
 Humidity: 58 %RH  
 ENGINEER: Shinichi Takano



## Radiated Emission

UL Japan, Inc.  
Shonan EMC Lab. No.3 Semi Anechoic Chamber

Sample No.: XCL0000002579  
Power: DC 3.7 V(Vbat)  
Mode: Transmitting 13.56MHz  
EUT axis: Below 30MHz( Horizontal Y-axis, Vertical Z-axis), NFC type B, with Tag  
Above 30MHz( Horizontal: Z-axis, Vertical: Z-axis), NFC type B, with Tag

Regulation: FCC Part15 Subpart C 15.225  
Test Distance: 3m  
Date: May 31, 2016  
Temperature: 24 deg.C  
Humidity: 58 %RH  
ENGINEER: Shinichi Takano

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.	27.12	QP	29.8	18.6	7.0	31.8	-40.0	-16.4	29.5	45.9	-	359	* Limit: 30m
Hori.	40.680	QP	40.7	13.7	7.3	31.8	0.0	29.9	40.0	10.1	248	224	
Hori.	54.240	QP	27.8	9.1	7.4	31.8	0.0	12.5	40.0	27.5	335	262	
Hori.	67.800	QP	28.4	6.3	7.4	31.8	0.0	10.3	40.0	29.7	258	50	
Hori.	81.360	QP	25.9	6.1	8.4	31.8	0.0	8.6	40.0	31.4	213	36	
Hori.	94.920	QP	35.1	8.8	8.3	31.8	0.0	20.4	43.5	23.1	166	42	
Hori.	108.480	QP	23.5	11.0	8.1	31.8	0.0	10.8	43.5	32.7	150	127	
Hori.	122.040	QP	29.1	12.8	8.2	31.8	0.0	18.3	43.5	25.2	124	229	
Hori.	135.600	QP	23.8	13.8	8.5	31.8	0.0	14.3	43.5	29.2	300	181	
Hori.	840.720	QP	33.6	21.5	9.5	31.6	0.0	33.0	46.0	13.0	100	326	
Vert.	27.12	QP	30.3	18.6	7.0	31.8	-40.0	-15.9	29.5	45.4	-	359	* Limit: 30m
Vert.	40.680	QP	46.8	13.7	7.3	31.8	0.0	36.0	40.0	<b>4.0</b>	100	130	
Vert.	54.240	QP	32.6	9.1	7.4	31.8	0.0	17.3	40.0	22.7	100	311	
Vert.	67.800	QP	31.7	6.3	7.4	31.8	0.0	13.6	40.0	26.4	100	332	
Vert.	81.360	QP	29.7	6.1	8.4	31.8	0.0	12.4	40.0	27.6	100	307	
Vert.	94.92	QP	44.5	8.8	8.3	31.8	0.0	29.8	43.5	13.7	100	131	
Vert.	108.48	QP	24.4	11.0	8.1	31.8	0.0	11.7	43.5	31.8	100	21	
Vert.	122.04	QP	37.0	12.8	8.2	31.8	0.0	26.2	43.5	17.3	100	139	
Vert.	135.60	QP	25.4	13.8	8.5	31.8	0.0	15.9	43.5	27.6	100	130	
Vert.	447.48	QP	31.1	16.7	7.5	31.9	0.0	23.4	46.0	22.6	117	41	

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).

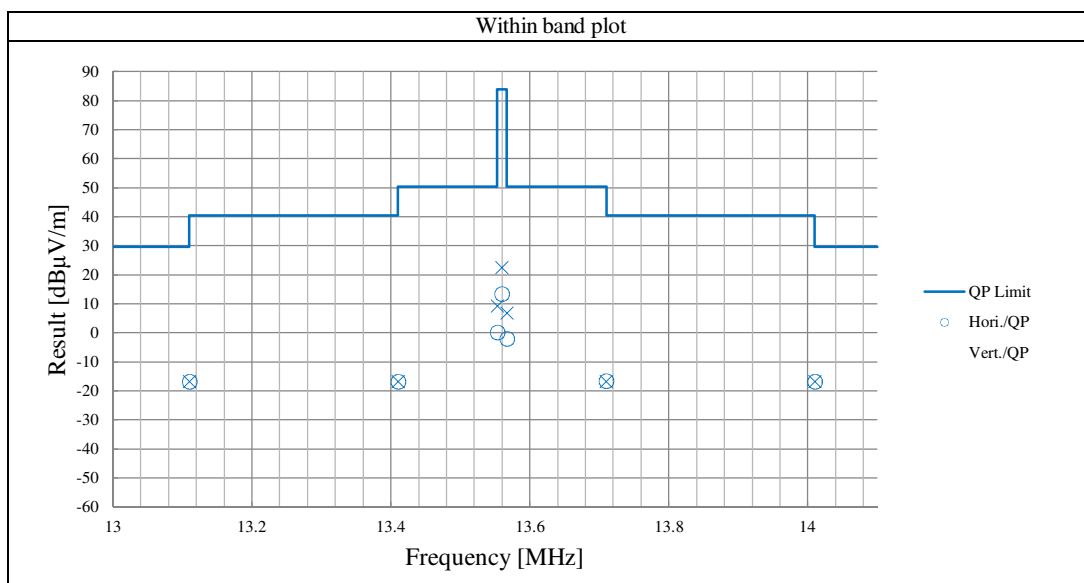
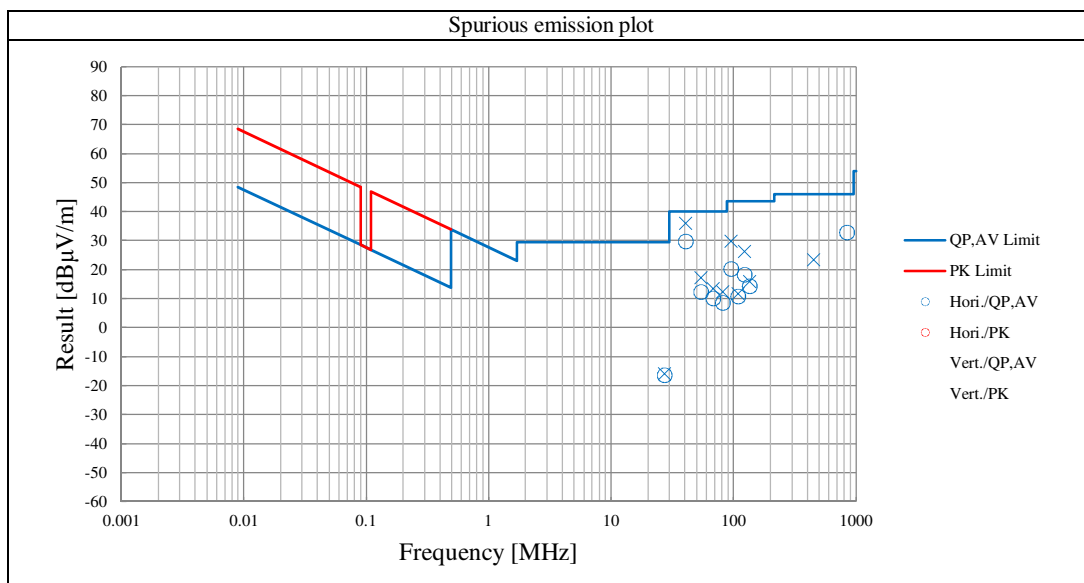
\* Carrier level (Result at 3m): Hor= 53.4dBuV/m, Ver= 62.6 dBuV/m

## Radiated Emission (Worst mode plot)

UL Japan, Inc.  
Shonan EMC Lab. No.3 Semi Anechoic Chamber

Sample No.: XCL0000002579  
 Power: DC 3.7 V(Vbat)  
 Mode: Transmitting 13.56MHz  
 EUT axis: Below 30MHz( Horizontal Y-axis, Vertical Z-axis), NFC type B, with Tag  
 Above 30MHz( Horizontal: Z-axis, Vertical: Z-axis), NFC type B, with Tag  
 Remarks: These plots data contains sufficient number to show the trend of characteristic features for EUT.

Regulation: FCC Part15 Subpart C 15.225  
 Test Distance: 3m  
 Date: May 31, 2016  
 Temperature: 24 deg.C  
 Humidity: 58 %RH  
 ENGINEER: Shinichi Takano



## Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded room

		Regulation	FCC Part15 Subpart C 15.225 (e)
Serial No.	XCL0000002577	Date	June 11, 2016
Power	DC 3.7 V ((Vbat) DC 3.7 V, (Vin) DC 5.0 V)	Temperature	26 deg.C
Mode	Transmitting 13.56 MHz (carrier output mode)	Humidity	42%
		ENGINEER	Shinichi Takano

### Temperature Variation: -20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559896	-0.000104	-0.00077	0.010
after 2minutes	13.56	13.559919	-0.000081	-0.00060	0.010
after 5minutes	13.56	13.559920	-0.000080	-0.00059	0.010
after 10minutes	13.56	13.559920	-0.000080	-0.00059	0.010

### Temperature Variation: -10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559918	-0.000082	-0.00060	0.010
after 2minutes	13.56	13.559916	-0.000084	-0.00062	0.010
after 5minutes	13.56	13.559913	-0.000087	-0.00064	0.010
after 10minutes	13.56	13.559912	-0.000088	-0.00065	0.010

### Temperature Variation: 0deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559910	-0.000090	-0.00066	0.010
after 2minutes	13.56	13.559888	-0.000112	-0.00083	0.010
after 5minutes	13.56	13.559883	-0.000117	-0.00086	0.010
after 10minutes	13.56	13.559880	-0.000120	-0.00088	0.010

### Temperature Variation: 10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559876	-0.000124	-0.00091	0.010
after 2minutes	13.56	13.559842	-0.000158	-0.00117	0.010
after 5minutes	13.56	13.559833	-0.000167	-0.00123	0.010
after 10minutes	13.56	13.559831	-0.000169	-0.00125	0.010

### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559793	-0.000207	-0.00153	0.010
after 2minutes	13.56	13.559751	-0.000249	-0.00184	0.010
after 5minutes	13.56	13.559744	-0.000256	-0.00189	0.010
after 10minutes	13.56	13.559740	-0.000260	-0.00192	0.010

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Shonan EMC Lab.

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## Data of Frequency Tolerance

### Temperature Variation: 30deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559743	-0.000257	-0.00190	0.010
after 2minutes	13.56	13.559719	-0.000281	-0.00207	0.010
after 5minutes	13.56	13.559710	-0.000290	-0.00214	0.010
after 10minutes	13.56	13.559707	-0.000293	-0.00216	0.010

### Temperature Variation: 40deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559696	-0.000304	-0.00224	0.010
after 2minutes	13.56	13.559657	-0.000343	-0.00253	0.010
after 5minutes	13.56	13.559650	-0.000350	-0.00258	0.010
after 10minutes	13.56	13.559646	-0.000354	-0.00261	0.010

### Temperature Variation: 50deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559638	-0.000362	-0.00267	0.010
after 2minutes	13.56	13.559610	-0.000390	-0.00288	0.010
after 5minutes	13.56	13.559605	-0.000395	-0.00291	0.010
after 10minutes	13.56	13.559603	-0.000397	-0.00293	0.010

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## Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded room

		Regulation	FCC Part15 Subpart C 15.225 (e)
Serial No.	XCL0000000361	Date	June 8, 2016
Power	DC 3.7 V ((Vbat) DC 3.7 V, (Vin) DC 5.0 V)	Temperature	24 deg.C
Mode	Transmitting 13.56 MHz (carrier output mode)	Humidity	42 %RH
		ENGINEER	Makoto Hosaka

### Temperature Variation: -20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560063	0.000063	0.00046	0.010
after 2minutes	13.56	13.560085	0.000085	0.00063	0.010
after 5minutes	13.56	13.560088	0.000088	0.00065	0.010
after 10minutes	13.56	13.560089	0.000089	0.00066	0.010

### Temperature Variation: -10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560088	0.000088	0.00065	0.010
after 2minutes	13.56	13.560092	0.000092	0.00068	0.010
after 5minutes	13.56	13.560090	0.000090	0.00066	0.010
after 10minutes	13.56	13.560090	0.000090	0.00066	0.010

### Temperature Variation: 0deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560088	0.000088	0.00065	0.010
after 2minutes	13.56	13.560075	0.000075	0.00055	0.010
after 5minutes	13.56	13.560071	0.000071	0.00052	0.010
after 10minutes	13.56	13.560069	0.000069	0.00051	0.010

### Temperature Variation: 10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560065	0.000065	0.00048	0.010
after 2minutes	13.56	13.560042	0.000042	0.00031	0.010
after 5minutes	13.56	13.560037	0.000037	0.00027	0.010
after 10minutes	13.56	13.560034	0.000034	0.00025	0.010

### Temperature Variation: 20deg.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	13.560000	0.000000	0.00000	0.010
after 5minutes	13.56	13.559994	-0.000006	-0.00004	0.010
after 10minutes	13.56	13.559992	-0.000008	-0.00006	0.010

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## Data of Frequency Tolerance

### Temperature Variation: 30deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559985	-0.000015	-0.00011	0.010
after 2minutes	13.56	13.559966	-0.000034	-0.00025	0.010
after 5minutes	13.56	13.559959	-0.000041	-0.00030	0.010
after 10minutes	13.56	13.559956	-0.000044	-0.00032	0.010

### Temperature Variation: 40deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559948	-0.000052	-0.00038	0.010
after 2minutes	13.56	13.559931	-0.000069	-0.00051	0.010
after 5minutes	13.56	13.559926	-0.000074	-0.00055	0.010
after 10minutes	13.56	13.559925	-0.000075	-0.00055	0.010

### Temperature Variation: 50deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559921	-0.000079	-0.00058	0.010
after 2minutes	13.56	13.559913	-0.000087	-0.00064	0.010
after 5minutes	13.56	13.559912	-0.000088	-0.00065	0.010
after 10minutes	13.56	13.559912	-0.000088	-0.00065	0.010

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## Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.3 Shielded room

Serial No. XCL0000002577  
 Power (Vbat) DC 3.7 V  
 Mode Transmitting 13.56 MHz  
 (carrier output mode)

Regulation FCC Part15 Subpart C 15.225 (e)  
 Date November 25, 2016  
 Temperature 20 deg.C  
 Humidity 28 %RH  
 ENGINEER Kenichi Adachi

### Voltage Variation: (Vbat) DC 3.7 V

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559731	-0.000269	-0.00198	0.010
after 2minutes	13.56	13.559707	-0.000293	-0.00216	0.010
after 5minutes	13.56	13.559702	-0.000298	-0.00220	0.010
after 10minutes	13.56	13.559698	-0.000302	-0.00223	0.010

### Voltage Variation: (Vbat) DC 2.72 V

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559743	-0.000257	-0.00190	0.010
after 2minutes	13.56	13.559722	-0.000278	-0.00205	0.010
after 5minutes	13.56	13.559717	-0.000283	-0.00209	0.010
after 10minutes	13.56	13.559711	-0.000289	-0.00213	0.010

### Voltage Variation: (Vbat) DC 5.175 V

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559713	-0.000287	-0.00212	0.010
after 2minutes	13.56	13.559684	-0.000316	-0.00233	0.010
after 5minutes	13.56	13.559676	-0.000324	-0.00239	0.010
after 10minutes	13.56	13.559672	-0.000328	-0.00242	0.010

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## Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.3 Shielded room

Serial No. XCL0000000361  
 Power (Vbat) DC 3.7 V  
 Mode Transmitting 13.56 MHz  
 (carrier output mode)

Regulation FCC Part15 Subpart C 15.225 (e)  
 Date November 25, 2016  
 Temperature 20 deg.C  
 Humidity 28 %RH  
 ENGINEER Kenichi Adachi

### Voltage Variation: (Vbat) DC 3.7 V

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559963	-0.000037	-0.00027	0.010
after 2minutes	13.56	13.559951	-0.000049	-0.00036	0.010
after 5minutes	13.56	13.559944	-0.000056	-0.00041	0.010
after 10minutes	13.56	13.559939	-0.000061	-0.00045	0.010

### Voltage Variation: (Vbat) DC 2.72 V

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559960	-0.000040	-0.00029	0.010
after 2minutes	13.56	13.559954	-0.000046	-0.00034	0.010
after 5minutes	13.56	13.559951	-0.000049	-0.00036	0.010
after 10minutes	13.56	13.559949	-0.000051	-0.00038	0.010

### Voltage Variation: (Vbat) DC 5.175 V

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559961	-0.000039	-0.00029	0.010
after 2minutes	13.56	13.559932	-0.000068	-0.00050	0.010
after 5minutes	13.56	13.559926	-0.000074	-0.00055	0.010
after 10minutes	13.56	13.559921	-0.000079	-0.00058	0.010

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## Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.3 Shielded room

Serial No. XCL0000002577  
 Power (Vin) DC 5.0 V  
 Mode Transmitting 13.56 MHz  
 (carrier output mode)

Regulation FCC Part15 Subpart C 15.225 (e)  
 Date November 25, 2016  
 Temperature 20 deg.C  
 Humidity 28 %RH  
 ENGINEER Kenichi Adachi

### Voltage Variation: (Vin) DC 5.0 V

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559741	-0.000259	-0.00191	0.010
after 2minutes	13.56	13.559708	-0.000292	-0.00215	0.010
after 5minutes	13.56	13.559698	-0.000302	-0.00223	0.010
after 10minutes	13.56	13.559692	-0.000308	-0.00227	0.010

### Voltage Variation: (Vin) DC 4.5 V \*

\* Vin tested voltage was DC 4.5 V since the EUT did not operate with the voltage below 4.5 V.

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559740	-0.000260	-0.00192	0.010
after 2minutes	13.56	13.559713	-0.000287	-0.00212	0.010
after 5minutes	13.56	13.559703	-0.000297	-0.00219	0.010
after 10minutes	13.56	13.559698	-0.000302	-0.00223	0.010

### Voltage Variation: (Vin) DC 5.75 V

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559718	-0.000282	-0.00208	0.010
after 2minutes	13.56	13.559692	-0.000308	-0.00227	0.010
after 5minutes	13.56	13.559684	-0.000316	-0.00233	0.010
after 10minutes	13.56	13.559681	-0.000319	-0.00235	0.010

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## Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.3 Shielded room

Serial No. XCL0000000361  
 Power (Vin) DC 5.0 V  
 Mode Transmitting 13.56 MHz  
 (carrier output mode)

Regulation FCC Part15 Subpart C 15.225 (e)  
 Date November 25, 2016  
 Temperature 20 deg.C  
 Humidity 28 %RH  
 ENGINEER Kenichi Adachi

### Voltage Variation: (Vin) DC 5.0 V

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559961	-0.000039	-0.00029	0.010
after 2minutes	13.56	13.559946	-0.000054	-0.00040	0.010
after 5minutes	13.56	13.559939	-0.000061	-0.00045	0.010
after 10minutes	13.56	13.559935	-0.000065	-0.00048	0.010

### Voltage Variation: (Vin) DC 4.5 V \*

\* Vin tested voltage was DC 4.5 V since the EUT did not operate with the voltage below 4.5 V.

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559960	-0.000040	-0.00029	0.010
after 2minutes	13.56	13.559944	-0.000056	-0.00041	0.010
after 5minutes	13.56	13.559941	-0.000059	-0.00044	0.010
after 10minutes	13.56	13.559939	-0.000061	-0.00045	0.010

### Voltage Variation: (Vin) DC 5.75 V

#### Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559964	-0.000036	-0.00027	0.010
after 2minutes	13.56	13.559946	-0.000054	-0.00040	0.010
after 5minutes	13.56	13.559937	-0.000063	-0.00046	0.010
after 10minutes	13.56	13.559932	-0.000068	-0.00050	0.010

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

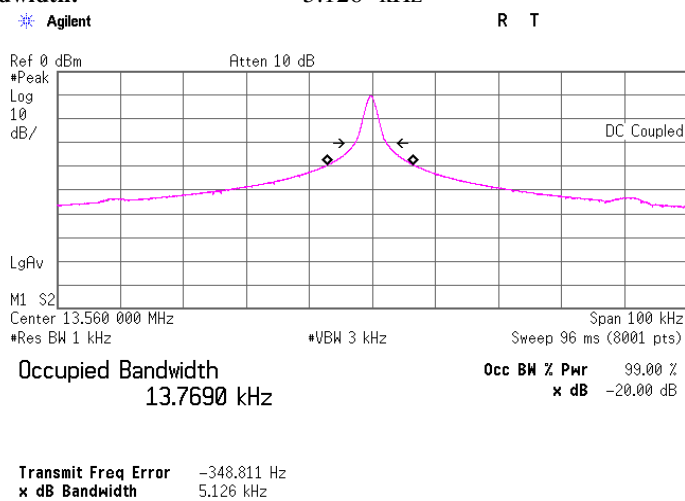
UL Japan, Inc.  
 Shonan EMC Lab. No.1 measurement room

Regulation: FCC Part15 Subpart C 15.215

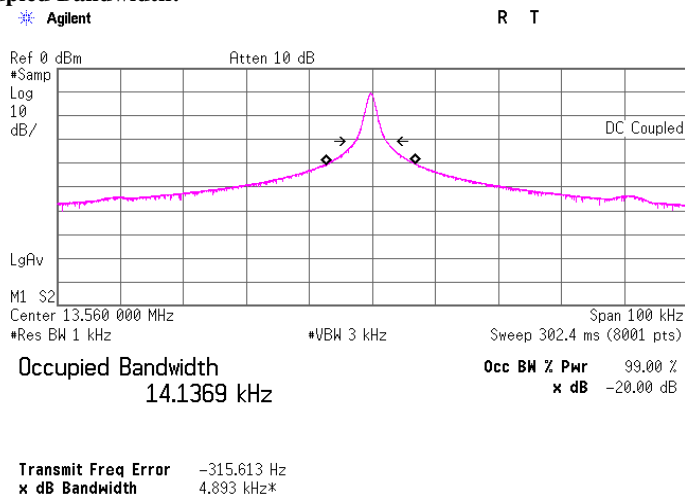
Sample No.: XCL0000002577  
 Power: DC 3.7 V(Vbat)  
 Mode: Transmitting 13.56MHz  
 NFC type A, worst: without tag

Date: May 31, 2016  
 Temperature: 26 deg.C  
 Humidity: 48 %RH  
 ENGINEER: Kenichi Adachi

**20dB Bandwidth:** 5.126 kHz



**99% Occupied Bandwidth:** 14.137 kHz



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

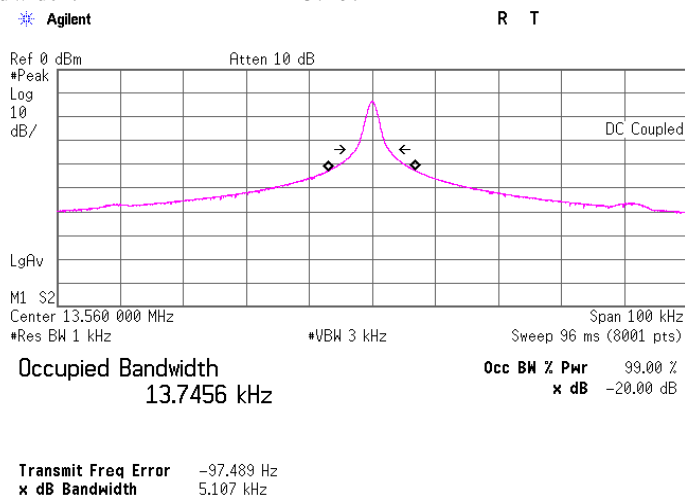
UL Japan, Inc.  
 Shonan EMC Lab. No.1 measurement room

Regulation: FCC Part15 Subpart C 15.215

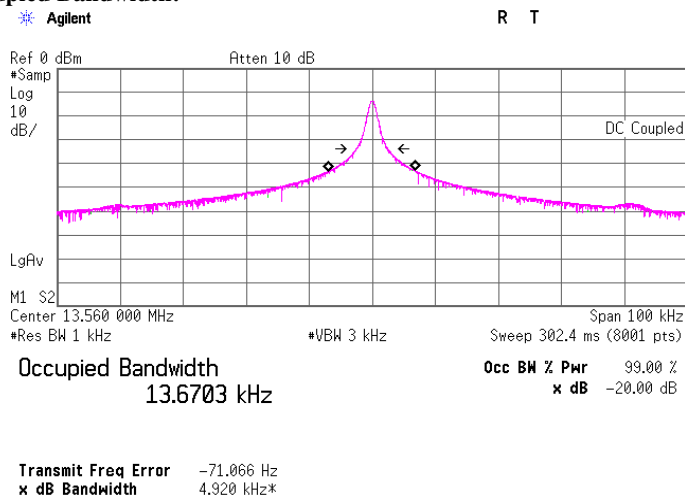
Sample No.: XCL0000000361  
 Power: DC 3.7 V(Vbat)  
 Mode: Transmitting 13.56MHz  
 NFC type A, worst: without tag

Date: May 31, 2016  
 Temperature: 26 deg.C  
 Humidity: 48 %RH  
 ENGINEER: Kenichi Adachi

**20dB Bandwidth:** 5.107 kHz



**99% Occupied Bandwidth:** 13.670 kHz



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

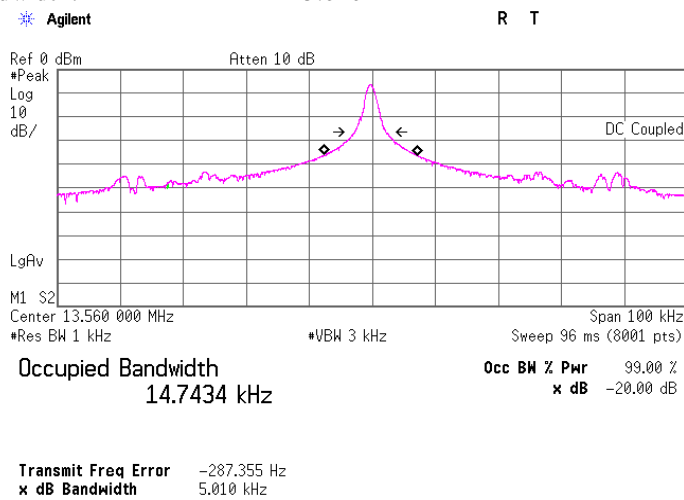
UL Japan, Inc.  
 Shonan EMC Lab. No.1 measurement room

Regulation: FCC Part15 Subpart C 15.215

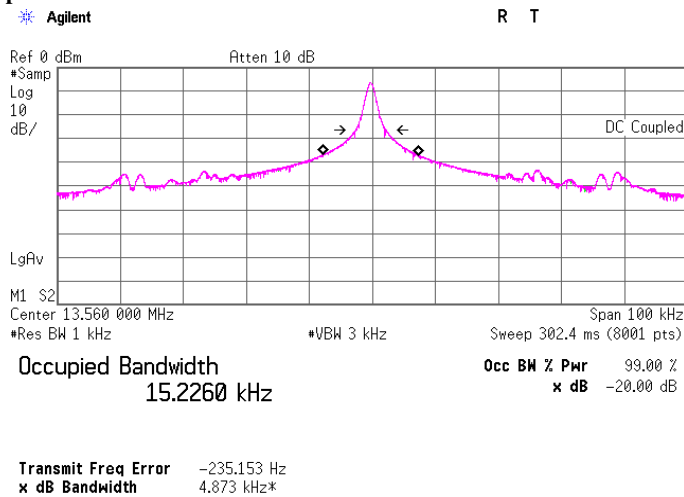
Sample No.: XCL0000002577  
 Power: DC 3.7 V(Vbat)  
 Mode: Transmitting 13.56MHz  
 NFC type B, worst: without tag

Date: May 31, 2016  
 Temperature: 26 deg.C  
 Humidity: 48 %RH  
 ENGINEER: Kenichi Adachi

**20dB Bandwidth:** 5.010 kHz



**99% Occupied Bandwidth:** 15.226 kHz



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

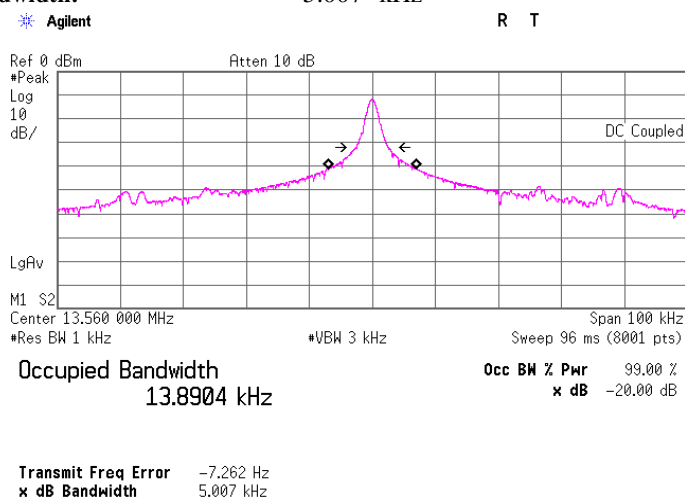
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Regulation: FCC Part15 Subpart C 15.215

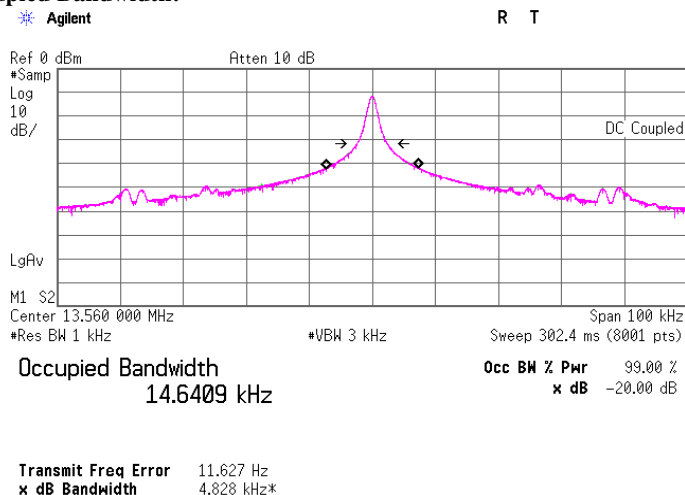
Sample No.: XCL0000000361  
 Power: DC 3.7 V(Vbat)  
 Mode: Transmitting 13.56MHz  
 NFC type B, worst: without tag

Date: May 31, 2016  
 Temperature: 26 deg.C  
 Humidity: 48 %RH  
 ENGINEER: Kenichi Adachi

**20dB Bandwidth:** 5.007 kHz



**99% Occupied Bandwidth:** 14.641 kHz



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

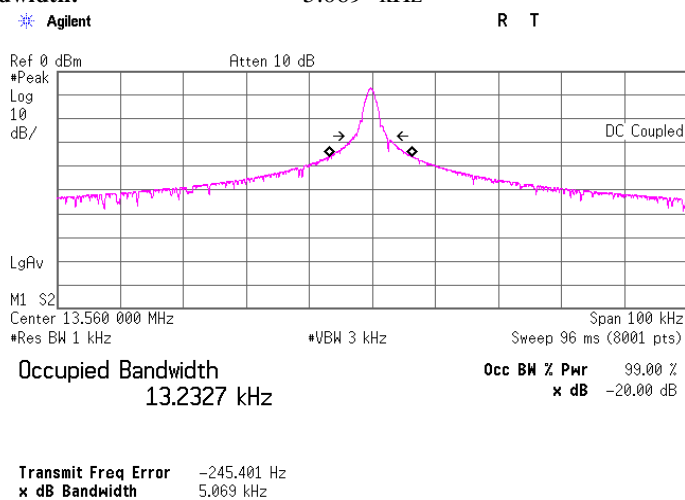
UL Japan, Inc.  
 Shonan EMC Lab. No.1 measurement room

Regulation: FCC Part15 Subpart C 15.215

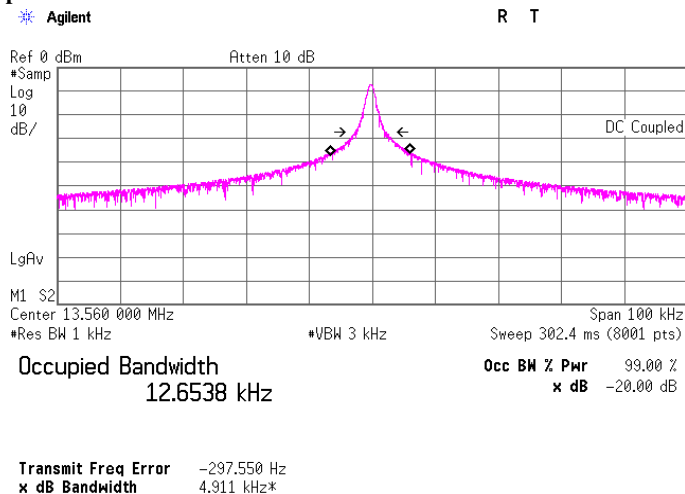
Sample No.: XCL0000002577  
 Power: DC 3.7 V(Vbat)  
 Mode: Transmitting 13.56MHz  
 NFC type F, worst: without tag

Date: May 31, 2016  
 Temperature: 26 deg.C  
 Humidity: 48 %RH  
 ENGINEER: Kenichi Adachi

**20dB Bandwidth:** 5.069 kHz



**99% Occupied Bandwidth:** 12.654 kHz



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

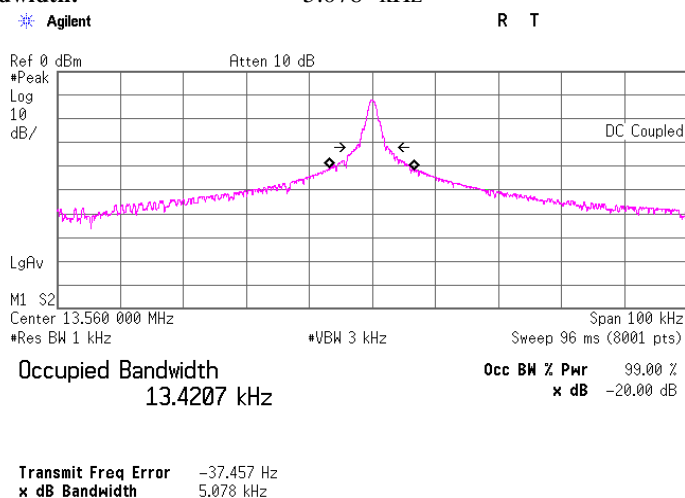
UL Japan, Inc.  
 Shonan EMC Lab. No.1 measurement room

Regulation: FCC Part15 Subpart C 15.215

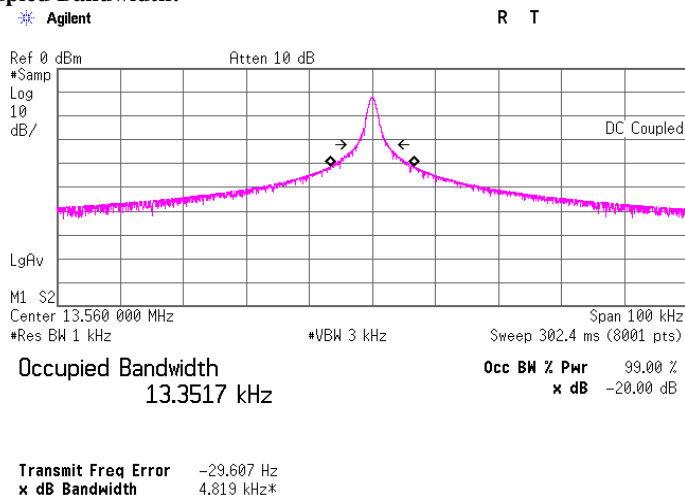
Sample No.: XCL0000000361  
 Power: DC 3.7 V(Vbat)  
 Mode: Transmitting 13.56MHz  
 NFC type F, worst: without tag

Date: May 31, 2016  
 Temperature: 26 deg.C  
 Humidity: 48 %RH  
 ENGINEER: Kenichi Adachi

**20dB Bandwidth:** 5.078 kHz



**99% Occupied Bandwidth:** 13.352 kHz



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## APPENDIX Test Instruments

### EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SFC-01	Microwave Counter	Agilent	53151A	US40511493	FT,BW	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-09	Humidity Indicator	A&D	AD-5681	4061484	FT,BW	2015/12/07 * 12
STIM-02	Timer	RS	440 9574	-	FT,BW	-
KTS-07	Digital Tester	SANWA	PC500	7019232	FT,BW	2016/10/17 * 12
STS-01	Digital Hitester	Hioki	3805-50	080997812	FT,BW	2016/10/17 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	FT	2015/12/07 * 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: Bandwidth

## APPENDIX 2 Test Instruments

### EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
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
SLS-02	LISN	Rohde & Schwarz	ENV216	100512	CE	2016/02/08 * 12
SAT3-10	Attenuator	JFW	50HF-003N	-	CE	2016/08/04 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	CE	2015/12/07 * 12
STM-01	Terminator	TME	CT-01 BP	-	CE	2015/12/18 * 12
STR-02	Test Receiver	Rohde & Schwarz	ESCI	100575	CE	2016/09/15 * 12
SJM-09	Measure	PROMART	SEN1935	-	CE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	CE	-
STS-02	Digital Hitester	Hioki	3805-50	080997819	CE	2016/03/22 * 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 ,

## APPENDIX 2 Test Instruments

### EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2016/02/19 * 12
SCC-A1/A3/A5/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2016/04/22 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2016/04/22 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2015/10/22 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2015/11/06 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2015/07/13 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
SAT6-12	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2015/08/31 * 12
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2015/11/14 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2015/12/18 * 12
SAT3-09	Attenuator	JFW	50HF-003N	-	RE	2015/08/31 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2015/10/11 * 12
SLA-01	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0888	RE	2015/10/11 * 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 :

RE: Radiated emission