



Test report No. : 10131696H-A-R1
Page : 1 of 26
Issued date : December 20, 2013
Revised date : December 25, 2013
FCC ID : UOEME-M26U

RADIO TEST REPORT

Test Report No. : 10131696H-A-R1

Applicant : Hitachi Maxell, Ltd.
Type of Equipment : RFID Reader/Writer Module
Model No. : ME-MA26CK09-A-UNV
Test regulation : FCC Part 15 Subpart C: 2013
FCC ID : UOEME-M26U
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.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 10131696H-A. 10131696H-A. is replaced with this report.

Date of test: December 13 to 25, 2013

Representative test engineer:

S. Matsuyama

Satofumi Matsuyama
Engineer of WiSE Japan,
UL Verification Service

Approved by:

M. Nishiyama

Masanori Nishiyama
Manager of WiSE Japan,
UL Verification Service



NVLAP LAB CODE: 200572-0

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<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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SECTION 1: Customer information

Company Name	:	Hitachi Maxell, Ltd.
Address	:	45-101 Kagamida, Oyamazaki, Otokuni, Kyoto, 618-8558 Japan
Telephone Number	:	+81-75-951-1465
Facsimile Number	:	+81-75-952-5873
Contact Person	:	Masayuki Nagano

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

2.1 Identification of E.U.T.

Type of Equipment	:	RFID Reader/Writer Module
Model No.	:	ME-MA26CK09-A-UNV
Serial No.	:	Refer to Section 4, Clause 4.2
Receipt Date of Sample	:	December 13, 2013
Country of Mass-production	:	Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

General Specification

Clock frequency(ies) in the system	:	CPU:6MHz
------------------------------------	---	----------

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	13.56MHz
Modulation	:	ASK
Power Supply	:	DC5.0/12.0V
Antenna type	:	Loop Coil
Antenna Gain	:	-76.20dBi
Operating Temperature	:	0 deg. C. to +40 deg. C

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013

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

*The EUT complies with FCC Part 15 Subpart B: 2013, final revised on September 30, 2013 and effective October 30, 2013.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements ----- <IC>RSS-Gen 7.2.2	Section 15.207 ----- <IC>RSS-Gen 7.2.2	[QP] 14.7dB 13.56000MHz L/N [AV] 4.6dB 13.56000MHz N	Complied	-
Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators ----- <IC> RSS-Gen 4.8, 4.11	Section 15.225(a) ----- <IC>RSS-210 A2.6	59.3dB, 13.56000MHz, QP, 45deg.	Complied	Radiated
Spectrum Mask	ANSI C63.4:2003 13. Measurement of intentional radiators ----- <IC>RSS-Gen 4.9, 4.11	Section 15.225(b)(c) ----- <IC> RSS-210 A2.6	40.0dB, 13.56700MHz, QP, 45deg.	Complied	Radiated
20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators ----- <IC> -	Section15.215(c) ----- <IC> -	See data	Complied	Radiated
Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators ----- <IC>RSS-Gen 4.9, 4.11	Section15.209, Section 15.225 (d) ----- <IC>RSS-210 A2.6	2.4dB 40.680MHz, Horizontal, QP	Complied	Radiated
Frequency Tolerance	ANSI C63.4:2003 13. Measurement of intentional radiators ----- <IC>RSS-Gen 4.7	Section15.225(e) ----- <IC> RSS-210 A2.6	See data	Complied	Radiated

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

FCC 15.31 (e)

The stable voltage (DC5.0/12.0V) is constantly supplied to the EUT from the end product. Therefore, the EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The antenna uses a unique coupling, so the EUT complies with the antenna requirement of Section 15.203/212.

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3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	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.

Test room (semi-anechoic chamber)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.6dB
No.4	3.5dB

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

*3m/1m/0.5m = 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 (3m)

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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	FCC Registration Number	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	313583	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	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	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	134570	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	2.4 x 3.4m	-

* 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, Data of EMI, 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)	-
The EUT was operated in a manner similar to typical use during the tests. The test was performed without tag as it was the worst condition compared to with tag.	

Test Item	Operating mode
Conducted Emission	Tx Mod on, without Tag
Electric Field Strength of Fundamental Emission	Tx Mod on, without Tag
Spectrum Mask	Tx Mod on, without Tag
20dB Bandwidth / 99% Occupied Bandwidth	Tx Mod on, without Tag
Electric Field Strength of Spurious Emission	Tx Mod on, without Tag
Frequency Tolerance	Tx Mod on, without Tag

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

Frequency Tolerance:

Temperature : -30deg.C to +50deg.C Step 10deg.C
Voltage : **(DC5.0V)**
Normal Voltage DC5.0V
Maximum Voltage DC 5.25V, Minimum Voltage DC 4.75V (depending on product specification)
(DC12.0V)
Normal Voltage DC12.0V
Maximum Voltage DC 12.5V, Minimum Voltage DC11.5V (depending on product specification)

*The stable voltage (DC5.0/12.0V) is constantly to the EUT regardless of input voltage

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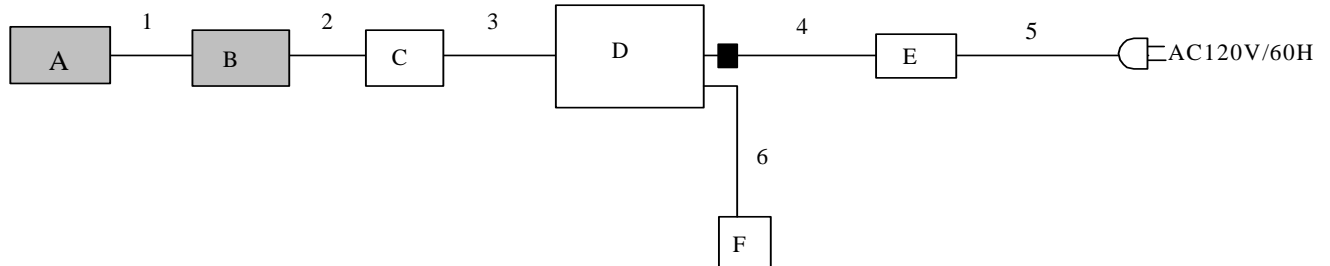
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4.2 Configuration and peripherals



■ : Standard Ferrite Core

*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	Antenna	-	-	Hitachi Maxell, Ltd.	EUT
B	RFID Reader/Writer Module	ME-MA26CK09-A-UNV	F4	Hitachi Maxell, Ltd.	EUT
C	IF Board	-	-	Hitachi Maxell, Ltd.	-
D	Laptop PC	HPCompaq NX9000	CNF3281X66	Hewlett-Packard	-
E	AC Adaptor	PPP014S	565C50AU40ZR DU	Hewlett-Packard	-
F	Mouse	M-S69	334684-002	Hewlett-Packard	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	0.15	Unshielded	Unshielded	-
2	Signal Cable	0.15	Unshielded	Unshielded	-
3	USB Cable	0.9	Shielded	Shielded	-
4	DC Cable	1.8	Unshielded	Unshielded	-
5	AC Cable	1.7	Unshielded	Unshielded	-
6	Mouse Cable	1.8	Shielded	Shielded	-

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SECTION 5: Conducted emission

5.1 Operating environment

Test place	: No.3 semi anechoic chamber.
Temperature	: See data
Humidity	: See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN/AMN 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 forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/ an AMN to the input power source. All unused 50ohm connectors of the LISN/ AMN were resistively terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a horizontal conducting plane 4.0 x 4.0m and a vertical conducting plane 2.0 x 2.0m in a semi Anechoic Chamber.

Photographs of the set up are shown in Appendix 3.

5.3 Test conditions

Frequency range	: 0.15MHz-30MHz
EUT position	: Table top
EUT operation mode	: See clause 4.1

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT in the semi Anechoic Chamber.

The EUT was connected to a Line Impedance Stabilization Network (LISN)/ Artificial Mains Network (AMN).

An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, with an average detector.

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

Detector Type	: QP and CISPR AV
IF Bandwidth	: 9kHz

5.5 Test result

Summary of the test results : Pass

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

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.5m by 1.0m, raised 0.8m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane. The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical (angle of loop antenna: 0deg., 45deg., 90deg., and 135 deg.) and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

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 30MHz	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Loop	Biconical	Logperiodic	Horn

Frequency	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz	Above 1GHz	
Instrument used	Test Receiver					Spectrum Analyzer	
Detector	PK/AV	QP	PK/AV	QP	QP		
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz
Test Distance	3m *1)	3m *1)	3m *1)	3m *2)	3m	3m	3m

*1) Distance Factor: $40 \times \log(3m/300m) = -80dB$

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

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

Measurement range : 0.009M-1GHz

Test data : APPENDIX

Test result : Pass

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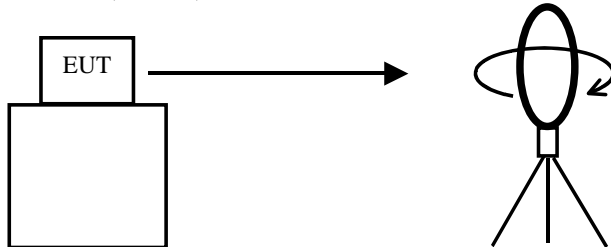
SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	100kHz	3kHz	10kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak *1)	Max Hold	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter
*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.							

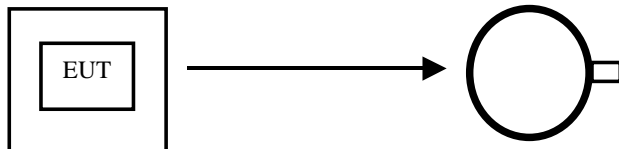
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

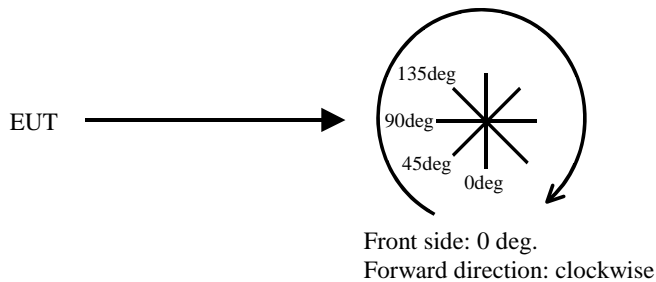


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



APPENDIX 1: Data of EMI test

Conducted emission

DATA OF CONDUCTED EMISSION TEST

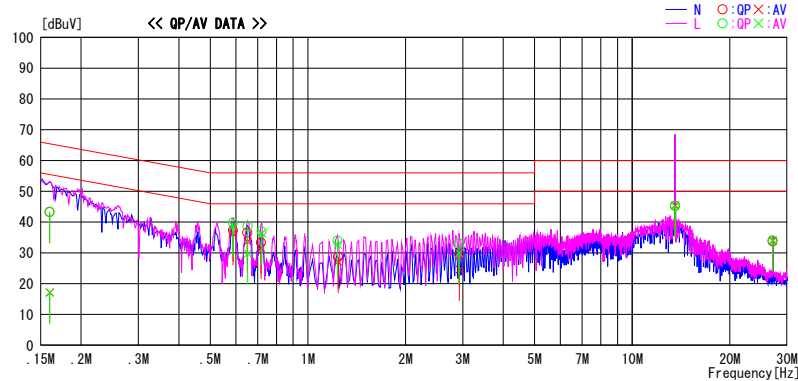
UL Japan, Inc. Head Office EMC Lab. No. 3 Semi Anechoic Chamber
Date : 2013/12/13

Report No. : 10131696H

Temp./Humi. : 22deg. C / 38% RH
Engineer : Shinya Watanabe

Mode / Remarks : Tx 13.56MHz without TAG

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15998	30.1	4.1	13.1	43.2	17.2	65.5	55.5	22.3	38.3	N	Terminated
0.58712	24.1	23.0	13.2	37.3	36.2	56.0	46.0	18.7	9.8	N	
0.65066	23.4	20.5	13.2	36.6	33.7	56.0	46.0	19.4	12.3	N	
0.71669	20.1	18.4	13.2	33.3	31.6	56.0	46.0	22.7	14.4	N	
1.23797	15.4	13.8	13.3	28.7	27.1	56.0	46.0	27.3	18.9	N	
2.93187	16.0	11.3	13.3	29.3	24.6	56.0	46.0	26.7	21.4	N	
13.56000	31.6	31.7	13.7	45.3	45.4	60.0	50.0	14.7	4.6	N	
27.12000	19.9	20.0	13.9	33.8	33.9	60.0	50.0	26.2	16.1	N	
0.15998	30.2	4.1	13.1	43.3	17.2	65.5	55.5	22.2	38.3	L	
0.58746	26.6	25.6	13.2	39.8	38.8	56.0	46.0	16.2	7.2	L	
0.65233	25.4	16.6	13.2	38.6	29.8	56.0	46.0	17.4	16.2	L	Terminated
0.72052	23.8	23.1	13.2	37.0	36.3	56.0	46.0	19.0	9.7	L	
1.23447	20.6	19.4	13.3	33.9	32.7	56.0	46.0	22.1	13.3	L	
2.92487	19.7	16.7	13.3	33.0	30.0	56.0	46.0	23.0	16.0	L	
13.56000	31.6	31.5	13.7	45.3	45.2	60.0	50.0	14.7	4.8	L	
27.12000	20.2	20.2	13.9	34.1	34.1	60.0	50.0	25.9	15.9	L	

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

*The test result is rounded off to one or two decimal places, so some differences might be observed.

NOTE: The above chart was obtained with the test configuration without the antenna terminated, but 13.56MHz test data was obtained with the antenna terminated according to KDB174176. There was no difference in test chart data between with and without antenna terminated.

Fundamental emission and Spectrum Mask (Pre Check)

DATA OF RADIATED EMISSION TEST

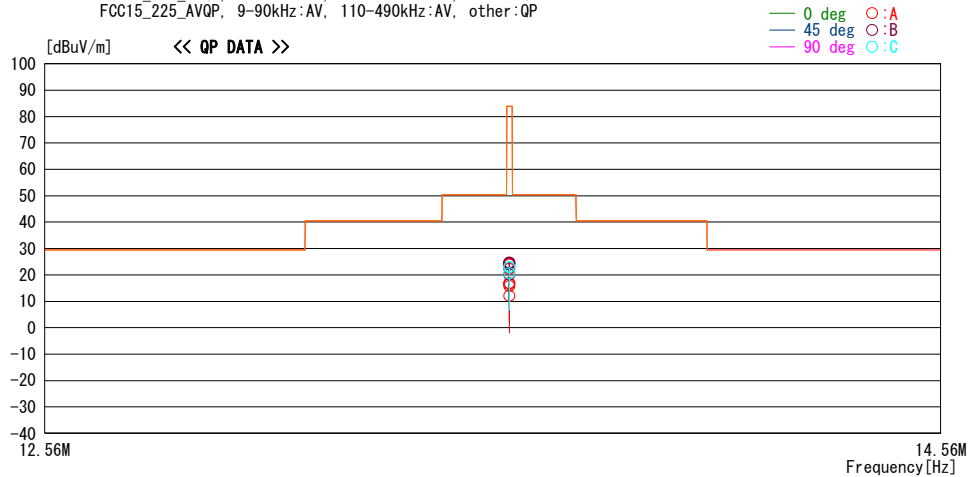
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/12/15

Report No. : 10131696H

Temp. / Humi. : 23deg. C / 41% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz Worst axis(Antenna:Z,Module:X) without TAG

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.56000	57.1	QP	19.7	-32.7	32.1	12.0	83.9	71.9	0	A	207 Ant:X
13.56000	65.2	QP	19.7	-32.7	32.1	20.1	83.9	63.8	45	B	172 Ant:X
13.56000	65.6	QP	19.7	-32.7	32.1	20.5	83.9	63.4	90	C	115 Ant:X
13.56000	61.8	QP	19.7	-32.7	32.1	16.7	83.9	67.2	135	A	72 Ant:X
13.56000	67.7	QP	19.7	-32.7	32.1	22.6	83.9	61.3	0	A	185 Ant:Y
13.56000	69.6	QP	19.7	-32.7	32.1	24.5	83.9	59.4	45	B	173 Ant:Y
13.56000	67.9	QP	19.7	-32.7	32.1	22.8	83.9	61.1	90	C	114 Ant:Y
13.56000	69.1	QP	19.7	-32.7	32.1	24.0	83.9	59.9	135	A	15 Ant:Y
13.56000	67.3	QP	19.7	-32.7	32.1	22.2	83.9	61.7	0	A	188 Ant:Z
13.56000	69.7	QP	19.7	-32.7	32.1	24.6	83.9	59.3	45	B	167 Ant:Z *Worst
13.56000	68.1	QP	19.7	-32.7	32.1	23.0	83.9	60.9	90	C	112 Ant:Z
13.56000	69.1	QP	19.7	-32.7	32.1	24.0	83.9	59.9	135	A	4 Ant:Z
13.56000	60.9	QP	19.7	-32.7	32.1	15.8	83.9	68.1	0	A	200 Ant:X Hor
13.56000	61.5	QP	19.7	-32.7	32.1	16.4	83.9	67.5	0	A	121 Ant:Y Hor
13.56000	62.0	QP	19.7	-32.7	32.1	16.9	83.9	67.0	0	A	181 Ant:Z Hor
13.56000	69.5	QP	19.7	-32.7	32.1	24.4	83.9	59.5	45	B	188 Ant:Z Mod:Y
13.56000	69.6	QP	19.7	-32.7	32.1	24.5	83.9	59.4	45	B	176 Ant:Z Mod:Z
13.56000	69.6	QP	19.7	-32.7	32.1	24.5	83.9	59.4	45	B	168 Ant:Z with TAG

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

Fundamental emission and Spectrum Mask

DATA OF RADIATED EMISSION TEST

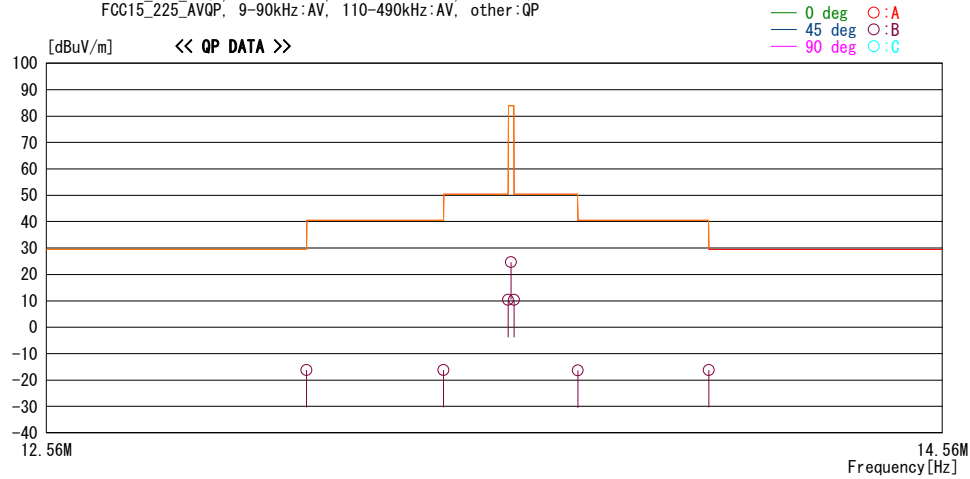
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/12/15

Report No. : 10131696H

Temp. / Humi. : 23deg. C / 41% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz Worst axis(Antenna:Z, Module:X) without TAG

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
13.11000	28.9	QP	19.7	-32.7	32.1	-16.2	29.5	45.7	45	B	167
13.41000	28.9	QP	19.7	-32.7	32.1	-16.2	40.5	56.7	45	B	167
13.55300	55.4	QP	19.7	-32.7	32.1	10.3	50.4	40.1	45	B	167
13.56000	69.7	QP	19.7	-32.7	32.1	24.6	83.9	59.3	45	B	167
13.56700	55.5	QP	19.7	-32.7	32.1	10.4	50.4	40.0	45	B	167
13.71000	28.8	QP	19.7	-32.7	32.1	-16.3	40.5	56.8	45	B	167
14.01000	28.9	QP	19.7	-32.7	32.1	-16.2	29.5	45.7	45	B	167

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. + D.FACTOR) - GAIN(AMP.)

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Spurious emission

DATA OF RADIATED EMISSION TEST

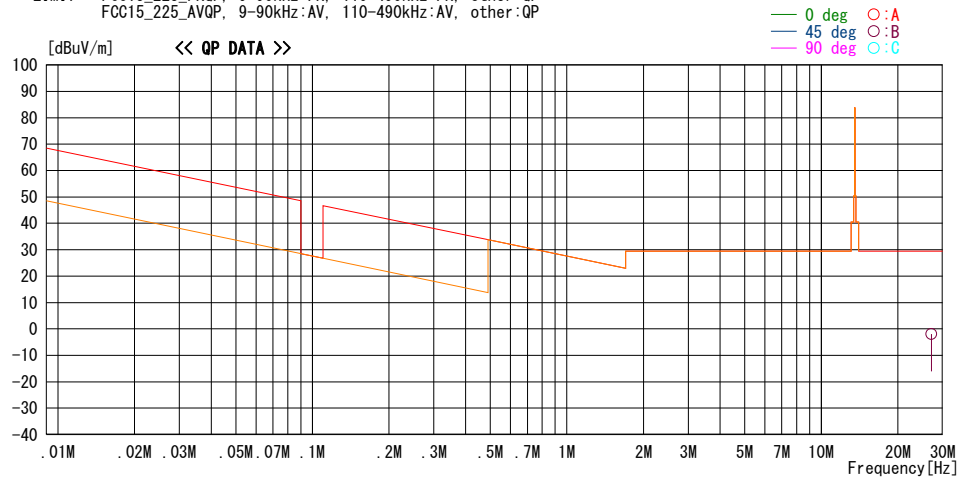
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/12/15

Report No. : 10131696H

Temp./ Humi. : 23deg. C / 41% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Tx 13.56MHz Worst axis(Antenna:Z, Module:X) without TAG

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



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	41.7	QP	20.7	-32.2	32.2	-2.0	29.5	31.5	45	B	176

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. + D.FACTOR) - GAIN(AMP.)

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Spurious emission

DATA OF RADIATED EMISSION TEST

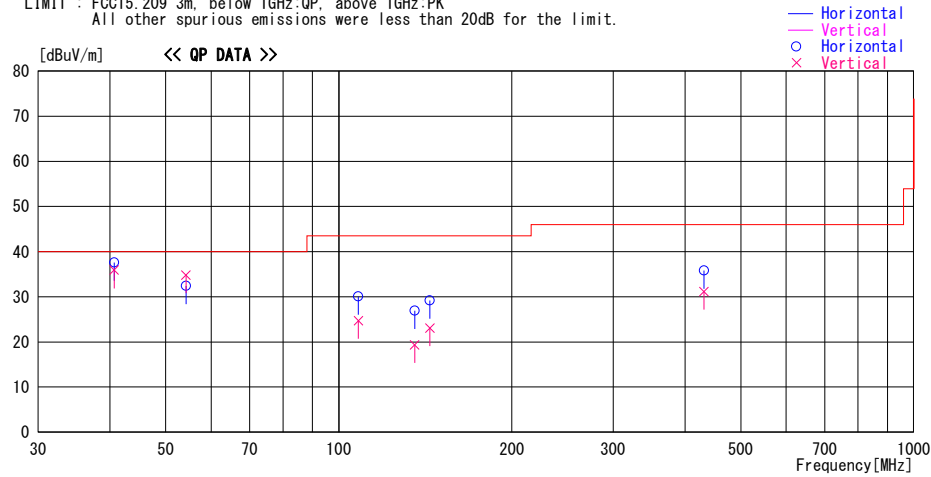
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2013/12/13

Report No. : 10131696H

Temp./Humi. : 22deg. C / 38% RH
Engineer : Shinya Watanabe

Mode / Remarks : Tx 13.56MHz without TAG Worst-Axis(Hori:Ant:X / Module:X / Ver:Ant:X / Module:X)

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



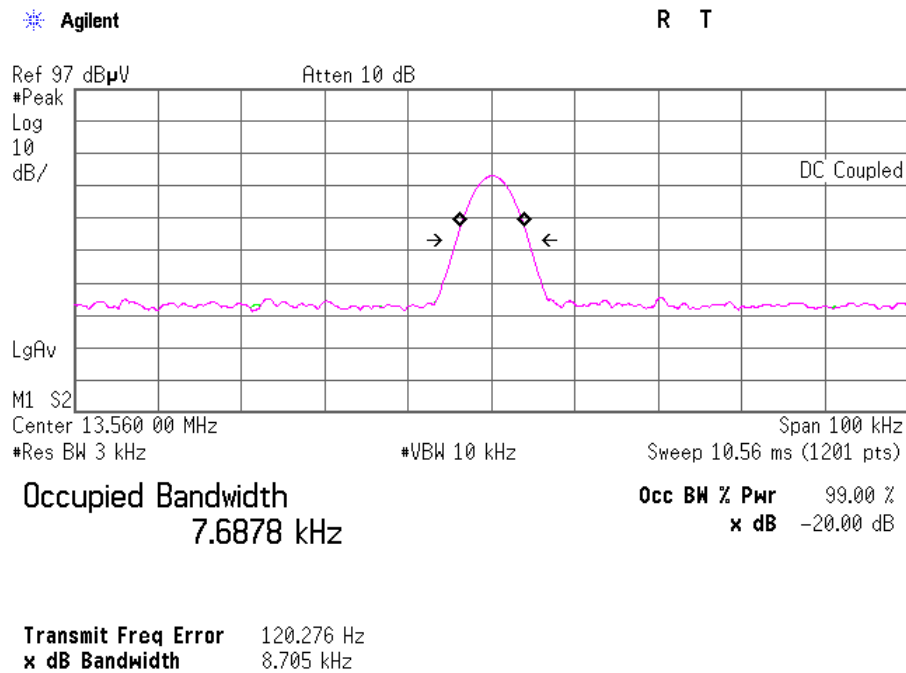
Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin
[MHz]	[dBuV]		Factor	Gain	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]
40.680	48.4	QP	14.2	-25.0	37.6	106	372	Hori.	40.0	2.4
40.680	46.7	QP	14.2	-25.0	35.9	17	100	Vert.	40.0	4.1
54.240	47.7	QP	9.4	-24.7	32.4	75	372	Hori.	40.0	7.6
54.240	50.1	QP	9.4	-24.7	34.8	120	100	Vert.	40.0	5.2
108.175	42.8	QP	11.3	-24.0	30.1	0	159	Hori.	43.5	13.4
108.175	37.4	QP	11.3	-24.0	24.7	56	100	Vert.	43.5	18.8
135.591	36.4	QP	14.1	-23.6	26.9	195	206	Hori.	43.5	16.6
135.591	28.9	QP	14.1	-23.6	19.4	50	100	Vert.	43.5	24.1
144.051	38.1	QP	14.7	-23.6	29.2	55	300	Hori.	43.5	14.3
144.051	32.0	QP	14.7	-23.6	23.1	96	100	Vert.	43.5	20.4
431.667	39.4	QP	17.7	-21.3	35.8	132	204	Hori.	46.0	10.2
431.667	34.8	QP	17.7	-21.3	31.2	20	192	Vert.	46.0	14.8

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)

20dB Bandwidth and 99% Occupied Bandwidth

Test place Head Office EMC Lab. No.1 Semi Anechoic Chamber
Report No. 10131696H
Date 12/15/2013
Temperature/ Humidity 23 deg.C / 41% RH
Engineer Satofumi Matsuyama
Mode Tx Mod on without Tag

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	8.71	7.69



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Frequency Tolerance (DC5.0V)

Test place Head Office EMC Lab. No.11 measurement room
Report No. 10131696H-A
Date 25/12/2013
Temperature/ Humidity 23 deg.C/ 36% RH
Engineer Tsubasa Takayama
Mode Transmitting mode

Test Condition deg.C Volts		Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
20deg.C	4.75V	Power on	13.5601132	0.0001132	8.35	100.00	91.65
		on 2min.	13.5601112	0.0001112	8.20	100.00	91.80
		on 5min.	13.5601091	0.0001091	8.05	100.00	91.95
		on 10min.	13.5601089	0.0001089	8.03	100.00	91.97
	5V	Power on	13.5601121	0.0001121	8.27	100.00	91.73
		on 2min.	13.5601113	0.0001113	8.21	100.00	91.79
		on 5min.	13.5601081	0.0001081	7.97	100.00	92.03
		on 10min.	13.5601077	0.0001077	7.94	100.00	92.06
	5.25V	Power on	13.5601092	0.0001092	8.05	100.00	91.95
		on 2min.	13.5601081	0.0001081	7.97	100.00	92.03
		on 5min.	13.5601072	0.0001072	7.91	100.00	92.09
		on 10min.	13.5601070	0.0001070	7.89	100.00	92.11
50deg.C.		Power on	13.5600272	0.0000272	2.01	100.00	97.99
		on 2min.	13.5600268	0.0000268	1.98	100.00	98.02
		on 5min.	13.5600264	0.0000264	1.95	100.00	98.05
		on 10min.	13.5600261	0.0000261	1.92	100.00	98.08
40deg.C.		Power on	13.5600305	0.0000305	2.25	100.00	97.75
		on 2min.	13.5600311	0.0000311	2.29	100.00	97.71
		on 5min.	13.5600339	0.0000339	2.50	100.00	97.50
		on 10min.	13.5600361	0.0000361	2.66	100.00	97.34
30deg.C.		Power on	13.5600421	0.0000421	3.10	100.00	96.90
		on 2min.	13.5600434	0.0000434	3.20	100.00	96.80
		on 5min.	13.5600522	0.0000522	3.85	100.00	96.15
		on 10min.	13.5600612	0.0000612	4.51	100.00	95.49
20deg.C.		Power on	13.5600937	0.0000937	6.91	100.00	93.09
		on 2min.	13.5600988	0.0000988	7.29	100.00	92.71
		on 5min.	13.5601002	0.0001002	7.39	100.00	92.61
		on 10min.	13.5601014	0.0001014	7.48	100.00	92.52
10deg.C.		Power on	13.5601056	0.0001056	7.79	100.00	92.21
		on 2min.	13.5601311	0.0001311	9.67	100.00	90.33
		on 5min.	13.5601329	0.0001329	9.80	100.00	90.20
		on 10min.	13.5601334	0.0001334	9.84	100.00	90.16
0deg.C.		Power on	13.5601508	0.0001508	11.12	100.00	88.88
		on 2min.	13.5601516	0.0001516	11.18	100.00	88.82
		on 5min.	13.5601541	0.0001541	11.36	100.00	88.64
		on 10min.	13.5601553	0.0001553	11.45	100.00	88.55
-10deg.C.		Power on	13.5601523	0.0001523	11.23	100.00	88.77
		on 2min.	13.5601524	0.0001524	11.24	100.00	88.76
		on 5min.	13.5601535	0.0001535	11.32	100.00	88.68
		on 10min.	13.5601603	0.0001603	11.82	100.00	88.18
-20deg.C		Power on	13.5601302	0.0001302	9.60	100.00	90.40
		on 2min.	13.5601201	0.0001201	8.86	100.00	91.14
		on 5min.	13.5601181	0.0001181	8.71	100.00	91.29
		on 10min.	13.5601177	0.0001177	8.68	100.00	91.32
-30deg.C		Power on	13.5600492	0.0000492	3.63	100.00	96.37
		on 2min.	13.5600501	0.0000501	3.70	100.00	96.30
		on 5min.	13.5600499	0.0000499	3.68	100.00	96.32
		on 10min.	13.5600492	0.0000492	3.63	100.00	96.37

Limit : 13.56 13.56 MHz +/-0.01 % (+/- 100ppm) = +/- 0.001356 MHz

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

Frequency Tolerance (DC12.0V)

Test place Head Office EMC Lab. No.11 measurement room
Report No. 10131696H-A
Date 25/12/2013
Temperature/ Humidity 23 deg.C/ 36% RH
Engineer Tsubasa Takayama
Mode Transmitting mode

Test Condition deg.C Volts		Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
20deg.C	11.5V	Power on	13.5601023	0.0001023	7.54	100.00	92.46
		on 2min.	13.5601031	0.0001031	7.60	100.00	92.40
		on 5min.	13.5601036	0.0001036	7.64	100.00	92.36
		on 10min.	13.5601022	0.0001022	7.54	100.00	92.46
	12V	Power on	13.5601072	0.0001072	7.91	100.00	92.09
		on 2min.	13.5601023	0.0001023	7.54	100.00	92.46
		on 5min.	13.5601031	0.0001031	7.60	100.00	92.40
		on 10min.	13.5601022	0.0001022	7.54	100.00	92.46
	12.5V	Power on	13.5601043	0.0001043	7.69	100.00	92.31
		on 2min.	13.5601031	0.0001031	7.60	100.00	92.40
		on 5min.	13.5601041	0.0001041	7.68	100.00	92.32
		on 10min.	13.5601041	0.0001041	7.68	100.00	92.32
50deg.C.	Power on	13.5600302	0.0000302	2.23	100.00	97.77	
	on 2min.	13.5600321	0.0000321	2.37	100.00	97.63	
	on 5min.	13.5600341	0.0000341	2.51	100.00	97.49	
	on 10min.	13.5600422	0.0000422	3.11	100.00	96.89	
40deg.C.	Power on	13.5600391	0.0000391	2.88	100.00	97.12	
	on 2min.	13.5600372	0.0000372	2.74	100.00	97.26	
	on 5min.	13.5600362	0.0000362	2.67	100.00	97.33	
	on 10min.	13.5600411	0.0000411	3.03	100.00	96.97	
30deg.C.	Power on	13.5600341	0.0000341	2.51	100.00	97.49	
	on 2min.	13.5600372	0.0000372	2.74	100.00	97.26	
	on 5min.	13.5600382	0.0000382	2.82	100.00	97.18	
	on 10min.	13.5600372	0.0000372	2.74	100.00	97.26	
20deg.C.	Power on	13.5600998	0.0000998	7.36	100.00	92.64	
	on 2min.	13.5600994	0.0000994	7.33	100.00	92.67	
	on 5min.	13.5600994	0.0000994	7.33	100.00	92.67	
	on 10min.	13.5600993	0.0000993	7.32	100.00	92.68	
10deg.C.	Power on	13.5601382	0.0001382	10.19	100.00	89.81	
	on 2min.	13.5601374	0.0001374	10.13	100.00	89.87	
	on 5min.	13.5601396	0.0001396	10.29	100.00	89.71	
	on 10min.	13.5601363	0.0001363	10.05	100.00	89.95	
0deg.C.	Power on	13.5601562	0.0001562	11.52	100.00	88.48	
	on 2min.	13.5601524	0.0001524	11.24	100.00	88.76	
	on 5min.	13.5601528	0.0001528	11.27	100.00	88.73	
	on 10min.	13.5601552	0.0001552	11.45	100.00	88.55	
-10deg.C.	Power on	13.5601642	0.0001642	12.11	100.00	87.89	
	on 2min.	13.5601649	0.0001649	12.16	100.00	87.84	
	on 5min.	13.5601652	0.0001652	12.18	100.00	87.82	
	on 10min.	13.5601657	0.0001657	12.22	100.00	87.78	
-20deg.C	Power on	13.5601341	0.0001341	9.89	100.00	90.11	
	on 2min.	13.5601348	0.0001348	9.94	100.00	90.06	
	on 5min.	13.5601386	0.0001386	10.22	100.00	89.78	
	on 10min.	13.5601382	0.0001382	10.19	100.00	89.81	
-30deg.C	Power on	13.5600692	0.0000692	5.10	100.00	94.90	
	on 2min.	13.5600722	0.0000722	5.32	100.00	94.68	
	on 5min.	13.5600683	0.0000683	5.04	100.00	94.96	
	on 10min.	13.5600699	0.0000699	5.15	100.00	94.85	
Limit :		13.56	13.56 MHz +/-0.01 % (+/- 100ppm) =		+/- 0.001356 MHz		

Limit : 13.56 13.56 MHz +/-0.01 % (+/- 100ppm) = +/- 0.001356 MHz

*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-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE (EUT)	2013/01/07 * 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	2013/07/23 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2013/01/22 * 12
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2013/08/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2013/02/26 * 12
MJM-21	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2013/06/07 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2013/10/30 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2013/07/22 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2W(7.5m)/RG400u(1.5m)/RFM-E421(Switcher)	-/01068(Switcher)	RE	2013/09/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2013/03/12 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2013/11/26 * 12
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2013/06/14 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2013/02/28 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2013/02/26 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2013/06/14 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2013/08/20 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2013/10/13 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2013/10/13 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2013/07/23 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2013/03/12 * 12
MFC-01	Microwave Counter	Advantest	R5373	120100309	FT	2013/08/07 * 12
MCH-04	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	14015723	FT	2013/08/23 * 12
MLPA-06	Loop Antenna	UL Japan	-	-	FT	Pre Check
MCH-06	Temperature and Humidity Chamber	Tabai Espec	PL-1KT	14007630	FT	2013/04/25 * 12
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	FT	2013/12/17 * 12

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.

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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, 20dB Bandwidth, 99% Occupied Bandwidth

FT: Frequency Tolerance

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