RADIO TEST REPORT

Test Report No. : 32JE0303-HO-01-R1

Applicant	:	**Mitsubishi Electric Corporation Inazawa Works**
Type of Equipment	:	**Proximity Card Reader module**
Model No.	:	**UCR-8303**
Test regulation	:	**FCC Part 15 Subpart C: 2012**
FCC ID	:	**YS34D454C2D5003**
Test Result	:	**Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with 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 32JE0303-HO-01. 32JE0303-HO-01 is replaced with this report.

Date of test: September 8 to October 3, 2012

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®
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.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116
Facsimile : +81 596 24 8124

CONTENTS **PAGE**

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116
Facsimile : +81 596 24 8124

SECTION 1: Customer information

Company Name	:	Mitsubishi Electric Corporation Inazawa Works
Address	:	No.1, Hishi-machi, Inazawa-shi, Aichi-ken, 492-8682, Japan
Telephone Number	:	+81-587-24-5560
Facsimile Number	:	+81-587-24-5768
Contact Person	:	Koki Okunishi

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

2.1 Identification of E.U.T.

Type of Equipment	:	Proximity Card Reader module
Model No.	:	UCR-8303
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12V
Receipt Date of Sample	:	September 5, 2012
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: UCR-8303, referred to as the EUT in this report, is the Proximity Card Reader module.

General Specification

Clock frequency(ies) in the system	:	11.0592MHz (Crystal), 27.12MHz (Crystal)

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	13.56MHz
Power Supply (inner)	:	DC 3.3V, DC 7V
Antenna type	:	Pattern antenna
Operating Temperature	:	-10deg.C. to +40deg.C.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2012, final revised on August 13, 2012 and effective September 12, 2012
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 revision on August 13, 2012 does not affect the test specification applied to the EUT.
* The EUT will be tested for compliance with FCC Part 15 Subpart B.

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	Section 15.207	[QP]19.4dB (27.12012MHz, L, with Card) [AV]9.4dB (27.12012MHz, L, with Card)	Complied	-
	<IC>RSS-Gen 7.2.2	<IC>RSS-Gen 7.2.2			
Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.225(a)	55.2dB 13.56000MHz, QP, 0deg., with Card	Complied	Radiated
	<IC> RSS-Gen 4.8, 4.11	<IC>RSS-210 A2.6			
Spectrum Mask	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.225(b)(c)	35.0dB 13.56700MHz, QP, 0deg., with Card	Complied	Radiated
	<IC>RSS-Gen 4.9, 4.11	<IC> RSS-210 A2.6			
20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.215(c)	See data	Complied	Radiated
	<IC> -	<IC> -			
Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.209, Section 15.225 (d)	1.3dB 325.666MHz, Horizontal, QP, with Card	Complied	Radiated
	<IC>RSS-Gen 4.9, 4.11	<IC>RSS-210 A2.6			
Frequency Tolerance	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.225(e)	See data	Complied	Radiated
	<IC>RSS-Gen 4.7	<IC> RSS-210 A2.6			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

FCC 15.31 (e)
The RF Module has its own regulator.
The RF Module is constantly provided voltage (DC 3.3V, DC 7V) through the regulator regardless of input voltage.
Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203/212.

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	3.6dB
No.3	3.6dB
No.4	3.6dB

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	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	5.1dB	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.

3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	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	4.75 x 5.4 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 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 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 : 1. Transmitting (Tx and Rx) with Card mode
2. Transmitting (Tx and Rx) without Card mode
3. Transmitting (Tx and Rx) without Card (Antenna terminated with dummy load) mode

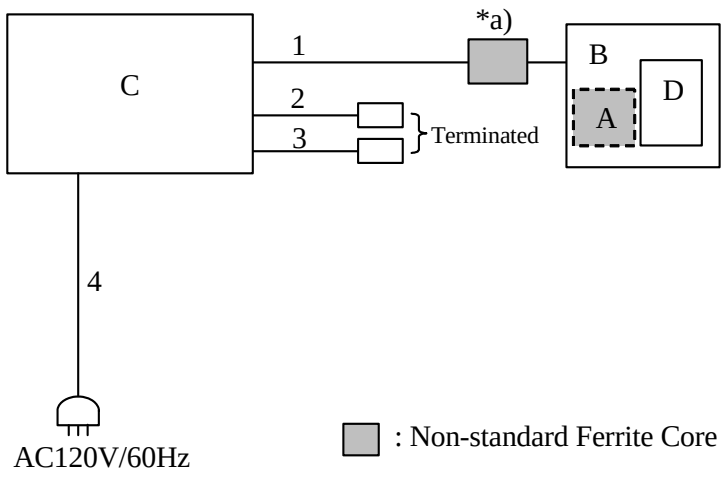
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

Frequency Tolerance:

Temperature : -10deg.C to +40deg.C Step 10deg.C
Voltage : Normal Voltage DC 12.0V
Maximum Voltage DC 13.8V, Minimum Voltage DC 10.2V (DC 12.0V ±15%)

* The RF Module has own regulator.
The RF Module is constantly provided voltage (DC 3.3V, DC 7V) through own regulator regardless of input voltage, so the testing was performed with AC120V only.

4.2 Configuration and peripherals



* 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	Remark
A	Proximity Card Reader module	UCR-8303	CS47 *1) CS42 *2)	Mitsubishi Electric Corporation Inazawa Works	EUT
B	Card Reader	UCR-8303-P	-	Mitsubishi Electric Corporation Inazawa Works	-
C	Power supply	-	-	Mitsubishi Electric Corporation Inazawa Works	-
D	Card	-	-	Mitsubishi Electric Corporation Inazawa Works	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	0.15	Unshielded	Unshielded	*a)
2	Signal Cable	0.3	Unshielded	Unshielded	-
3	Signal Cable	0.3	Unshielded	Unshielded	-
4	AC Cable	1.2	Unshielded	Unshielded	-

<Notes for Ferrite cores>

*a) 1 Ferrite Core, Model No. GRFC-7 (Manufacturer: KGS), 6.5cm from Item A, 3 turns.
*This is Removal Ferrite Core that is included in finished goods.

*1) Used for all tests except for 13.56MHz of Conducted emission test without Card (Antenna was terminated with dummy load)
*2) Used for 13.56MHz of Conducted emission test without Card (Antenna was terminated with dummy load)

SECTION 5: Conducted emission

5.1 Operating environment

Test place : No.2 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 AV
IF Bandwidth : 9kHz

5.5 Test result

Summary of the test results : Pass

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

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, 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
Antenna Type	Loop	Biconical	Logperiodic

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
Instrument used	Test Receiver				
Detector	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

The worst distance in use between EUT and card was confirmed and the test was performed by following condition.
Below 30MHz: 4cm
Above 30MHz: 0cm

*The test was made on EUT in the normal use position.

* FCC Part 15 Section 15.31 (f)(2) / IC RSS-Gen 4.11 (9kHz-30MHz)

$$9\text{kHz} - 490\text{kHz}\,[\text{Limit at 3m}] = [\text{Limit at 300m}] - 40\log\left(\frac{3}{300}\right)$$

$$490\text{kHz} - 30\text{MHz}[\text{Limit at 3m}] = [\text{Limit at 30m}] - 40\log\left(\frac{3}{30}\right)$$

Measurement range : **0.09M-1GHz**
Test data : **APPENDIX**
Test result : **Pass**

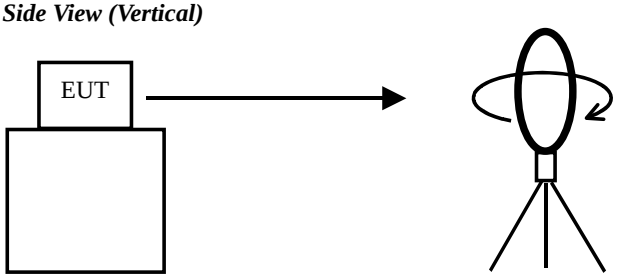
SECTION 7: Other test

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	100kHz	1kHz	3kHz	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 *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter
*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100%.							

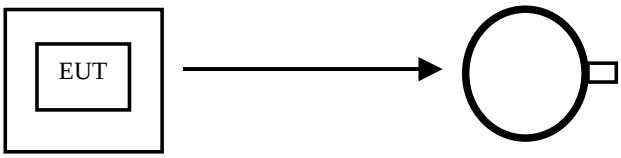
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

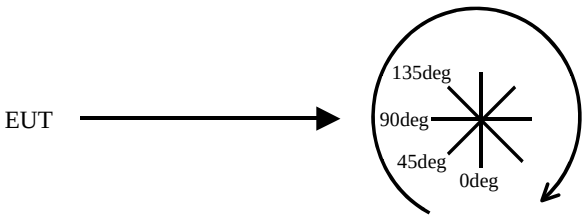


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

APPENDIX 1: Data of EMI test

Conducted emission

DATA OF CONDUCTED EMISSION TEST

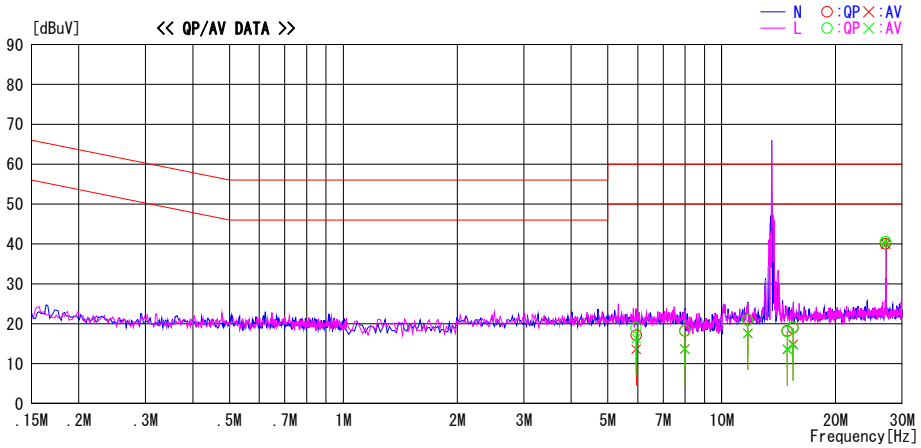
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/09/09

Report No. : 32JE0303-HO-01

Temp./Humi. : 24deg. C / 67% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Transmitting(Tx and Rx) with Card mode

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]		
5.94530	3.2	-0.3	13.9	17.1	13.6	60.0	50.0	42.9	36.4	N	
7.99173	4.1	-0.4	14.1	18.2	13.7	60.0	50.0	41.8	36.3	N	
11.71808	6.3	3.0	14.6	20.9	17.6	60.0	50.0	39.1	32.4	N	
14.91293	3.4	-1.2	14.8	18.2	13.6	60.0	50.0	41.8	36.4	N	
15.44624	4.1	0.1	14.8	18.9	14.9	60.0	50.0	41.1	35.1	N	
27.12000	24.5	24.5	15.5	40.0	40.0	60.0	50.0	20.0	10.0	N	
5.94022	5.1	2.4	13.9	19.0	16.3	60.0	50.0	41.0	33.7	L	
7.98993	4.2	-0.4	14.1	18.3	13.7	60.0	50.0	41.7	36.3	L	
11.71767	6.3	3.0	14.6	20.9	17.6	60.0	50.0	39.1	32.4	L	
14.91093	3.2	-1.2	14.8	18.0	13.6	60.0	50.0	42.0	36.4	L	
15.44378	4.3	-0.1	14.8	19.1	14.7	60.0	50.0	40.9	35.3	L	
27.12012	25.1	25.1	15.5	40.6	40.6	60.0	50.0	19.4	9.4	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.

Conducted emission

DATA OF CONDUCTED EMISSION TEST

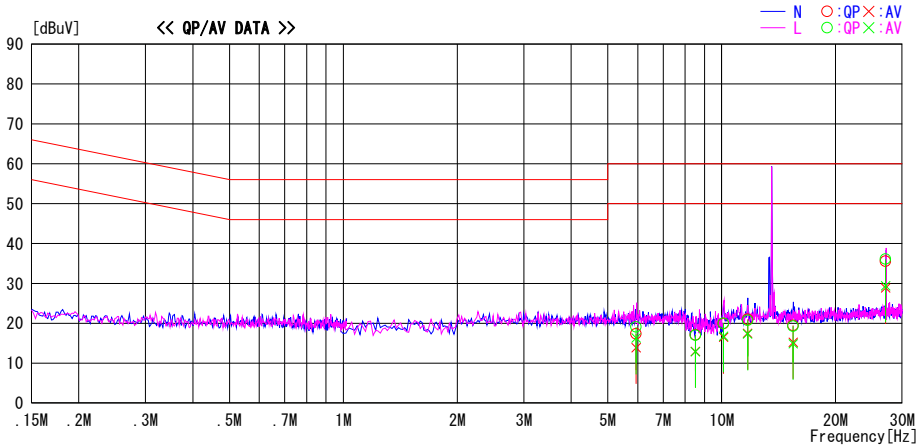
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/09/09

Report No. : 32JE0303-HO-01

Temp./Humi. : 24deg. C / 67% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Transmitting(Tx and Rx) without Card mode

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]		
5.94176	3.5	0.0	13.9	17.4	13.9	60.0	50.0	42.6	36.1	N	
8.51966	3.0	-1.1	14.1	17.1	13.0	60.0	50.0	42.9	37.0	N	
10.11495	5.5	2.1	14.4	19.9	16.5	60.0	50.0	40.1	33.5	N	
11.71368	6.4	2.9	14.6	21.0	17.5	60.0	50.0	39.0	32.5	N	
15.44035	4.7	0.4	14.8	19.5	15.2	60.0	50.0	40.5	34.8	N	
27.12000	20.1	13.4	15.5	35.6	28.9	60.0	50.0	24.4	21.1	N	
5.94223	5.2	2.4	13.9	19.1	16.3	60.0	50.0	40.9	33.7	L	
8.51677	2.9	-1.2	14.1	17.0	12.9	60.0	50.0	43.0	37.1	L	
10.11150	5.6	2.4	14.4	20.0	16.8	60.0	50.0	40.0	33.2	L	
11.71248	6.1	2.7	14.6	20.7	17.3	60.0	50.0	39.3	32.7	L	
15.43985	4.5	0.1	14.8	19.3	14.9	60.0	50.0	40.7	35.1	L	
27.12000	20.6	13.9	15.5	36.1	29.4	60.0	50.0	23.9	20.6	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.

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116
Facsimile : +81 596 24 8124

Conducted emission

DATA OF CONDUCTED EMISSION TEST

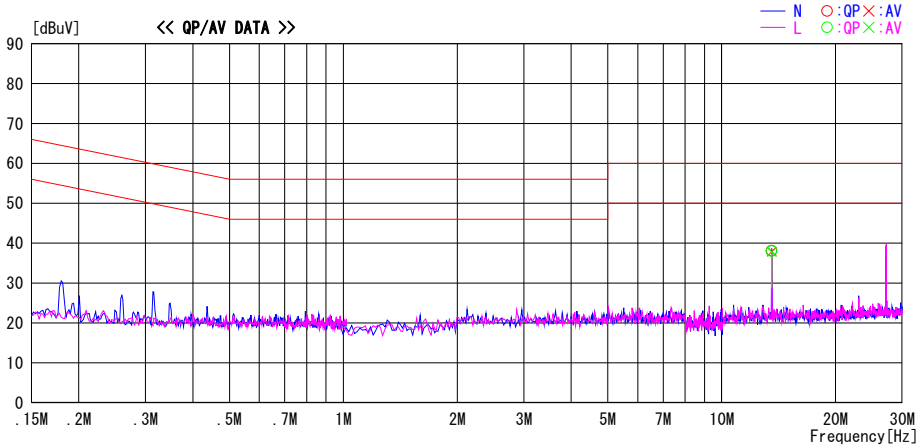
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/09/09

Report No. : 32JE0303-HO-01

Temp./Humi. : 24deg. C / 67% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Transmitting (Tx and Rx) without Card (Antenna terminated with dummy load) mode

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	23.3	23.1	14.8	38.1	37.9	60.0	50.0	21.9	12.1	N	
13.56000	23.2	23.0	14.8	38.0	37.8	60.0	50.0	22.0	12.2	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.

Fundamental emission and Spectrum Mask

DATA OF RADIATED EMISSION TEST

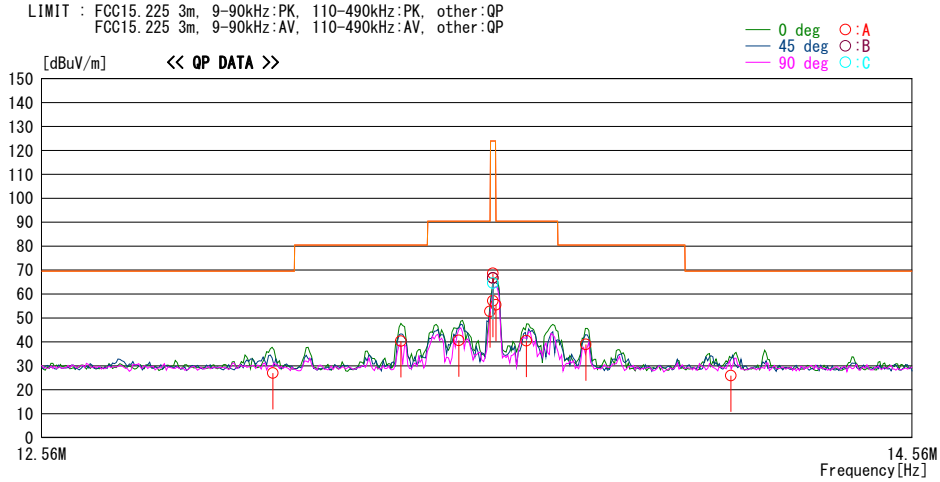
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/09/09

Report No. : 32JE0303-HO-01

Temp./ Humi. : 24deg. C / 67% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Transmitting(Tx and Rx) with Card mode, Worst-axis(Z-axis)

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 3m, 9-90kHz:AV, 110-490kHz:AV, other:QP



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
13.06266	32.9	QP	19.2	7.0	32.1	27.0	69.5	42.5	0	A	0	
13.34936	46.4	QP	19.0	7.0	32.1	40.3	80.5	40.2	0	A	0	
13.48160	46.8	QP	19.0	7.0	32.1	40.7	90.4	49.7	0	A	0	
13.55300	58.8	QP	18.9	7.1	32.1	52.7	90.4	37.7	0	A	0	
13.56000	63.3	QP	18.9	7.1	32.1	57.2	123.9	66.7	0	A	0	Loop:Hor
13.56000	74.8	QP	18.9	7.1	32.1	68.7	123.9	55.2	0	A	0	Worst
13.56000	72.8	QP	18.9	7.1	32.1	66.7	123.9	57.2	45	B	334	
13.56000	70.6	QP	18.9	7.1	32.1	64.5	123.9	59.4	90	C	281	
13.56000	72.8	QP	18.9	7.1	32.1	66.7	123.9	57.2	135	A	219	
13.56700	61.5	QP	18.9	7.1	32.1	55.4	90.4	35.0	0	A	0	
13.63686	46.5	QP	18.9	7.1	32.1	40.4	90.4	50.0	0	A	0	
13.77510	45.0	QP	18.9	7.1	32.1	38.9	80.5	41.6	0	A	0	
14.11842	32.2	QP	18.8	7.1	32.1	26.0	69.5	43.5	0	A	0	

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.)

Fundamental emission and Spectrum Mask

DATA OF RADIATED EMISSION TEST

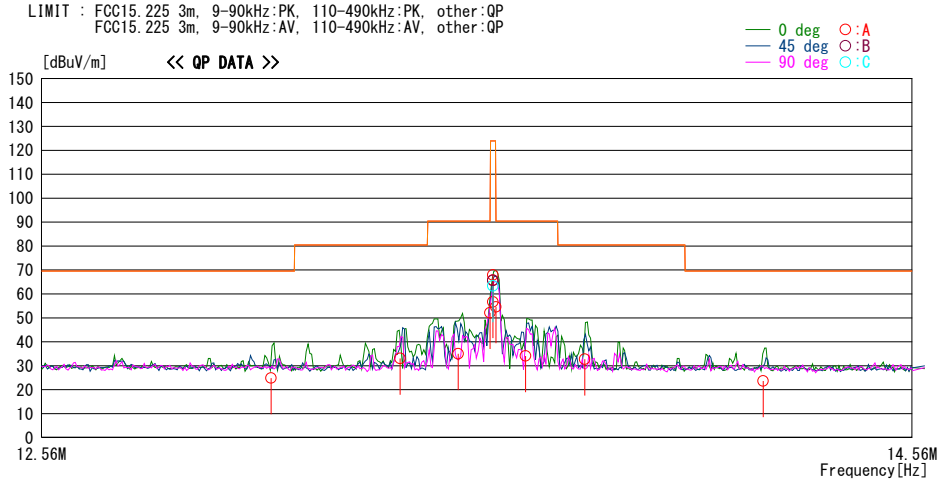
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/09/09

Report No. : 32JE0303-HO-01

Temp./ Humi. : 24deg. C / 67% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Transmitting(Tx and Rx) without Card mode,

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 3m, 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]	
13.05881	30.7	QP	19.2	7.0	32.1	24.8	69.5	44.7	0	A	0	
13.34804	39.1	QP	19.0	7.0	32.1	33.0	80.5	47.5	0	A	0	
13.48012	41.1	QP	19.0	7.0	32.1	35.0	90.4	55.4	0	A	0	
13.55300	58.2	QP	18.9	7.1	32.1	52.1	90.4	38.3	0	A	0	
13.56000	62.8	QP	18.9	7.1	32.1	56.7	123.9	67.2	0	A	14	Loop:Hor
13.56000	74.0	QP	18.9	7.1	32.1	67.9	123.9	56.0	0	A	0	Worst
13.56000	71.8	QP	18.9	7.1	32.1	65.7	123.9	58.2	45	B	333	
13.56000	69.5	QP	18.9	7.1	32.1	63.4	123.9	60.5	90	C	302	
13.56000	71.9	QP	18.9	7.1	32.1	65.8	123.9	58.1	135	A	14	
13.56700	60.6	QP	18.9	7.1	32.1	54.5	90.4	35.9	0	A	0	
13.63529	40.2	QP	18.9	7.1	32.1	34.1	90.4	56.3	0	A	0	
13.77284	38.8	QP	18.9	7.1	32.1	32.7	80.5	47.8	0	A	0	
14.19663	29.9	QP	18.8	7.1	32.1	23.7	69.5	45.8	0	A	0	

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.)

Spurious emission

DATA OF RADIATED EMISSION TEST

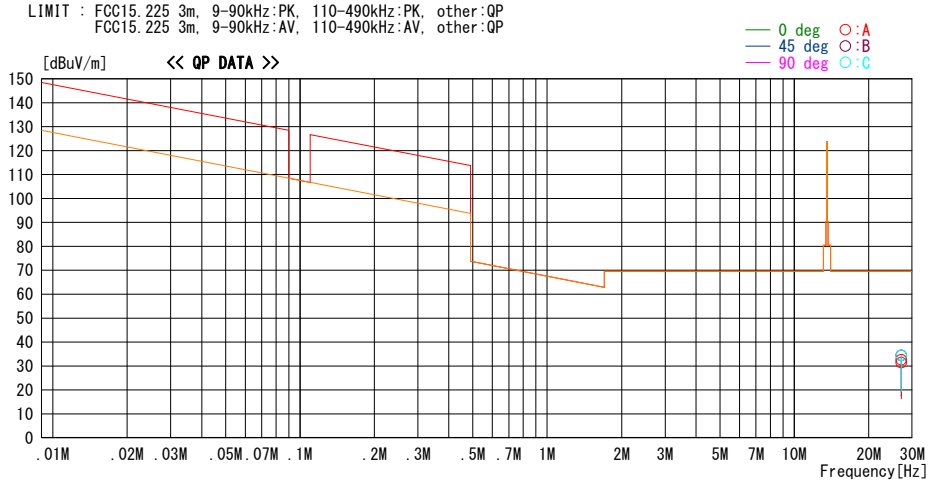
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/09/09

Report No. : 32JE0303-HO-01

Temp./ Humi. : 24deg. C / 67% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Transmitting(Tx and Rx) with Card mode, Worst-axis(Z-axis)

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 3m, 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	37.0	QP	18.9	7.5	32.0	31.4	69.5	38.1	0	A	0	
27.12000	40.0	QP	18.9	7.5	32.0	34.4	69.5	35.1	45	B	156	
27.12000	40.0	QP	18.9	7.5	32.0	34.4	69.5	35.1	90	C	108	
27.12000	38.2	QP	18.9	7.5	32.0	32.6	69.5	36.9	135	A	59	

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.)

Spurious emission

DATA OF RADIATED EMISSION TEST

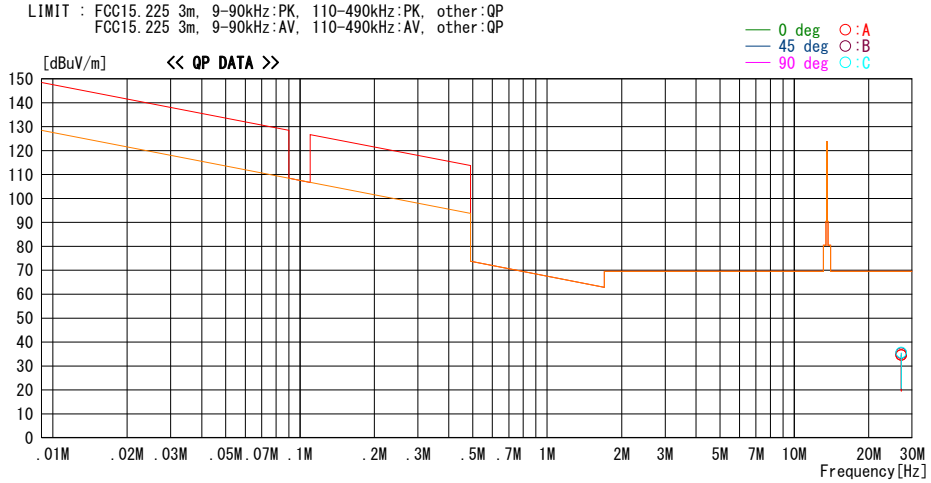
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/09/09

Report No. : 32JE0303-HO-01

Temp./ Humi. : 24deg. C / 67% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : Transmitting(Tx and Rx) without Card mode, Worst-axis(Z-axis)

LIMIT : FCC15.225 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.225 3m, 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	40.2	QP	18.9	7.5	32.0	34.6	69.5	34.9	0	A	172	
27.12000	40.9	QP	18.9	7.5	32.0	35.3	69.5	34.2	45	B	144	
27.12000	41.3	QP	18.9	7.5	32.0	35.7	69.5	33.8	90	C	107	
27.12000	40.1	QP	18.9	7.5	32.0	34.5	69.5	35.0	135	A	53	

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.)

Spurious emission

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab.

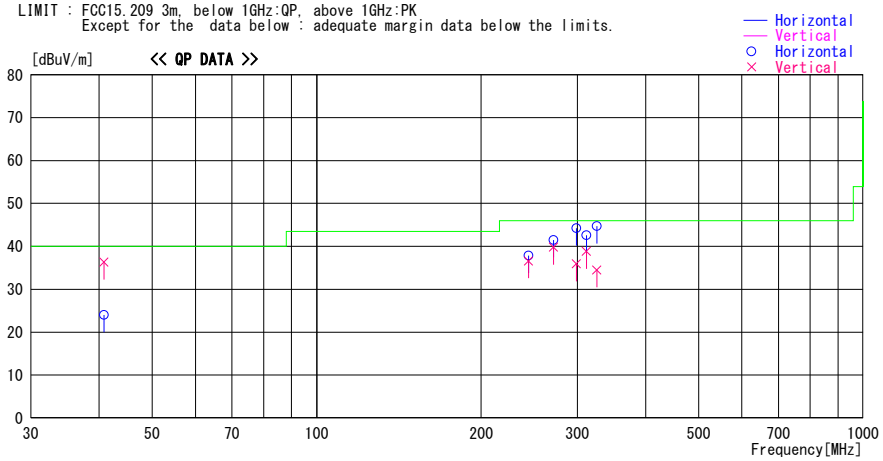
No.4 Semi Anechoic Chamber
Date : 2012/10/02

Report No. : 32JE0303-HO-01

Temp./Humi. : 23deg. C / 54% RH
Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting(Tx and Rx) with Card mode

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



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]	
40.800	34.2	QP	14.5	-24.7	24.0	182	100	Hori.	40.0	16.0	
40.800	46.5	QP	14.5	-24.7	36.3	150	100	Vert.	40.0	3.7	
244.199	43.5	QP	17.1	-22.8	37.8	122	100	Hori.	46.0	8.2	
244.199	42.3	QP	17.1	-22.8	36.6	290	100	Vert.	46.0	9.4	
271.199	45.6	QP	18.5	-22.6	41.5	119	100	Hori.	46.0	4.5	
271.199	43.9	QP	18.5	-22.6	39.8	247	100	Vert.	46.0	6.2	
298.650	46.5	QP	20.1	-22.4	44.2	116	100	Hori.	46.0	1.8	
298.650	38.2	QP	20.1	-22.4	35.9	308	100	Vert.	46.0	10.1	
311.667	48.7	QP	16.2	-22.3	42.6	327	100	Hori.	46.0	3.4	
311.667	44.9	QP	16.2	-22.3	38.8	196	100	Vert.	46.0	7.2	
325.666	50.4	QP	16.5	-22.2	44.7	327	100	Hori.	46.0	1.3	
325.666	40.2	QP	16.5	-22.2	34.5	196	100	Vert.	46.0	11.5	

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

Spurious emission

DATA OF RADIATED EMISSION TEST

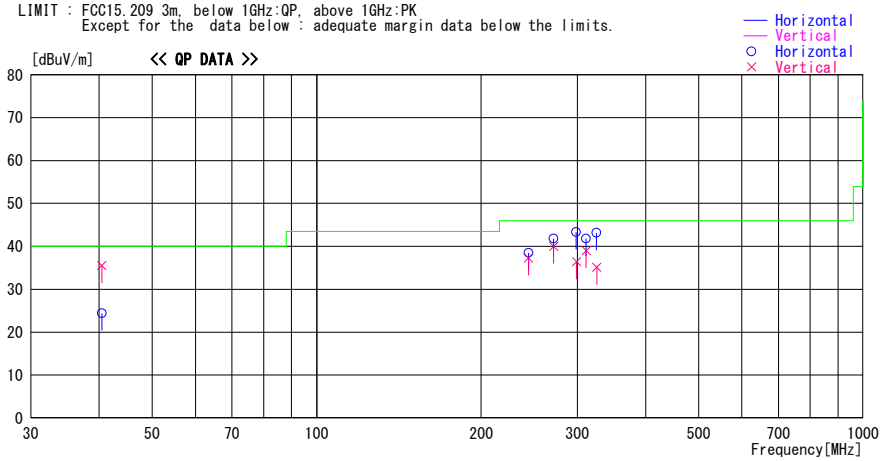
UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/10/02

Report No. : 32JE0303-HO-01

Temp./Humi. : 23deg. C / 54% RH
Engineer : Tomotaka Sasagawa

Mode / Remarks : Transmitting(Tx and Rx) without Card mode

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



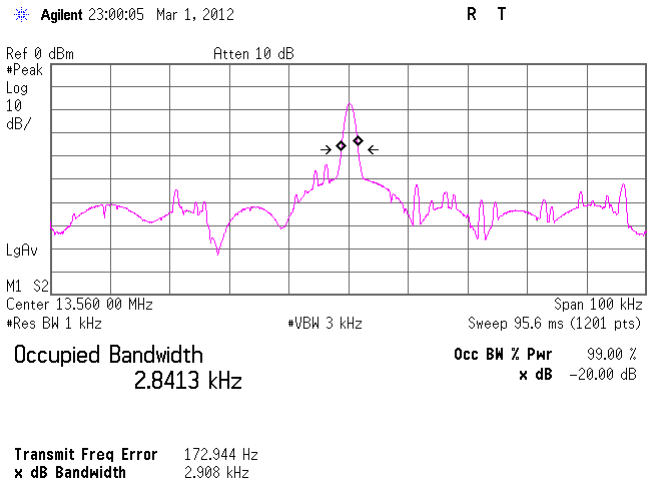
Frequency [MHz]	Reading [dBuV]	DET	Antenna Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
40.452	34.5	QP	14.6	-24.7	24.4	201	100	Hori.	40.0	15.6	
40.443	45.6	QP	14.6	-24.7	35.5	156	100	Vert.	40.0	4.5	
244.321	44.2	QP	17.1	-22.8	38.5	145	100	Hori.	46.0	7.5	
244.213	43.0	QP	17.1	-22.8	37.3	298	100	Vert.	46.0	8.7	
271.381	45.9	QP	18.5	-22.6	41.8	122	100	Hori.	46.0	4.2	
271.514	44.1	QP	18.5	-22.6	40.0	256	100	Vert.	46.0	6.0	
298.321	45.6	QP	20.1	-22.4	43.3	76	100	Hori.	46.0	2.7	
298.993	38.7	QP	20.1	-22.4	36.4	311	100	Vert.	46.0	9.6	
311.320	47.9	QP	16.2	-22.3	41.8	325	100	Hori.	46.0	4.2	
311.321	45.1	QP	16.2	-22.3	39.0	201	100	Vert.	46.0	7.0	
325.421	48.9	QP	16.5	-22.2	43.2	322	100	Hori.	46.0	2.8	
325.451	40.8	QP	16.5	-22.2	35.1	234	100	Vert.	46.0	10.9	

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

20dB Bandwidth and 99% Occupied Band Width

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	32JE0303-HO-01
Date	09/09/2012
Temperature/ Humidity	24 deg.C / 67% RH
Engineer	Satofumi Matsuyama
Mode	Transmitting(Tx and Rx) with Card mode

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	2.91	2.84



Frequency Tolerance

Test place	Head Office EMC Lab. No.6 measurement room
Report No.	32JE0303-HO-01
Date	09/10/2012
Temperature/ Humidity	22 deg.C/ 54% RH
Engineer	Hiroshi Kukita
Mode	Tx Mod off without Card

Test Condition deg.C	Volts	Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
20deg.C	10.2V	Power on	13.56023030	0.00023030	16.98	100.00	83.02
		on 2min.	13.56023460	0.00023460	17.30	100.00	82.70
		on 5min.	13.56023890	0.00023890	17.62	100.00	82.38
		on 10min.	13.56024030	0.00024030	17.72	100.00	82.28
	12V	Power on	13.56025300	0.00025300	18.66	100.00	81.34
		on 2min.	13.56023750	0.00023750	17.51	100.00	82.49
		on 5min.	13.56022890	0.00022890	16.88	100.00	83.12
		on 10min.	13.56021560	0.00021560	15.90	100.00	84.10
	13.8V	Power on	13.56023780	0.00023780	17.54	100.00	82.46
		on 2min.	13.56024340	0.00024340	17.95	100.00	82.05
		on 5min.	13.56024490	0.00024490	18.06	100.00	81.94
		on 10min.	13.56025150	0.00025150	18.55	100.00	81.45
40deg.C.	12V	Power on	13.56023530	0.00023530	17.35	100.00	82.65
		on 2min.	13.56023210	0.00023210	17.12	100.00	82.88
		on 5min.	13.56023630	0.00023630	17.43	100.00	82.57
		on 10min.	13.56023810	0.00023810	17.56	100.00	82.44
30deg.C.		Power on	13.56035230	0.00035230	25.98	100.00	74.02
		on 2min.	13.56022470	0.00022470	16.57	100.00	83.43
		on 5min.	13.56021850	0.00021850	16.11	100.00	83.89
		on 10min.	13.56021230	0.00021230	15.66	100.00	84.34
20deg.C.		Power on	13.56025400	0.00025400	18.73	100.00	81.27
		on 2min.	13.56023180	0.00023180	17.09	100.00	82.91
		on 5min.	13.56021989	0.00021989	16.22	100.00	83.78
		on 10min.	13.56021430	0.00021430	15.80	100.00	84.20
10deg.C.		Power on	13.56026800	0.00026800	19.76	100.00	80.24
		on 2min.	13.56026830	0.00026830	19.79	100.00	80.21
		on 5min.	13.56026760	0.00026760	19.73	100.00	80.27
		on 10min.	13.56026850	0.00026850	19.80	100.00	80.20
0deg.C.		Power on	13.56026830	0.00026830	19.79	100.00	80.21
		on 2min.	13.56026840	0.00026840	19.79	100.00	80.21
		on 5min.	13.56026820	0.00026820	19.78	100.00	80.22
		on 10min.	13.56026830	0.00026830	19.79	100.00	80.21
-10deg.C.		Power on	13.56023510	0.00023510	17.34	100.00	82.66
		on 2min.	13.56026100	0.00026100	19.25	100.00	80.75
		on 5min.	13.56026040	0.00026040	19.20	100.00	80.80
		on 10min.	13.56026110	0.00026110	19.26	100.00	80.74

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

* The tests at 50deg.C. and -20deg.C. were not applied since the specification of operating temperature of EUT was -10deg.C. to 40deg.C. and the EUT was only used in this temperature range.

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE/CE	2012/06/29 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE/CE	2012/02/06 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE/CE	2012/04/03 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2011/10/23 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2011/10/23 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2012/02/16 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2011/09/26 * 12 *1)
MCH-04	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	14015723	FT	2012/08/01 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	FT	2012/02/06 * 12
MBM-10	Barometer	Sunoh	SBR121	832	FT	2010/12/13 * 36
MFC-01	Microwave Counter	Advantest	R5373	120100309	FT	2012/08/16 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE	2012/02/06 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	CE	2012/02/16 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2012/01/28 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/29 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2011/11/23 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2012/04/05 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2011/11/16 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2011/11/16 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2012/06/01 * 12
AT-38	Attenuator	Anritsu	MP721B	6200961025	RE	2011/12/08 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2012/03/05 * 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: RE: Radiated Emission
CE: Conducted Emission
FT: Frequency Tolerance