




RADIO TEST REPORT

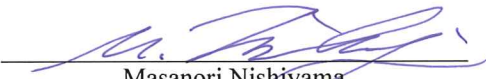
Test Report No. : 4786002526H-A

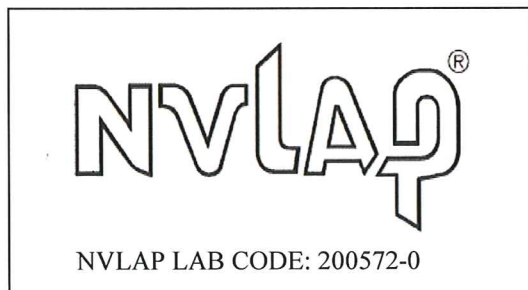
Applicant : DENSO WAVE INCORPORATED
Type of Equipment : RFID TAG Handy Reader Writer
Model No. : SE1-HU
Test regulation : FCC Part 15 Subpart C: 2012
FCC ID : PZWSE1HU001
Test Result : Complied

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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.

Date of test: February 24 to 27, 2013

Representative test engineer: 
Takumi Shimada
Engineer of WiSE Japan,
UL Verification Service

Approved by: 
Masanori Nishiyama
Manager of WiSE Japan,
UL Verification Service



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>

CONTENTS	PAGE
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.)	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing	8
SECTION 5: Conducted emission	10
SECTION 6: Radiated emission (Fundamental , Spurious Emission and Spectrum Mask)	11
SECTION 7: Other test	12
APPENDIX 1: Data of EMI test	13
Conducted emission	13
Fundamental emission and Spectrum Mask.....	14
Spurious emission	15
Frequency Tolerance	18
APPENDIX 2: Test instruments	19
APPENDIX 3: Photographs of test setup	20
Conducted emission	20
Radiated emission	21
Worst Case Position.....	22

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SECTION 1: Customer information

Company Name : DENSO WAVE INCORPORATED
Address : 1, Yoshiike, Kusaki, Agui-cho, Chita-gun, Aichi, 470-2297 Japan
Telephone Number : +81-569-49-5342
Facsimile Number : +81-569-49-5488
Contact Person : Osamu Nakashima

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

2.1 Identification of E.U.T.

Type of Equipment : RFID TAG Handy Reader Write
Model No. : SE1-HU
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : February 15, 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 : MAIN 20MHz (PLL:120 MHz), RF: 13.56MHz

Radio Specification

Radio Type : Transceiver
Frequency of Operation : 13.56MHz
Modulation : ASK
Power Supply (inner) : DC 5V
Antenna type : Loop Coil
Antenna Gain : -79.05dBi
Operating Temperature : -0deg.C to 40deg.C

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : Test specification: FCC Part 15 Subpart C: 2012, final revised on December 27, 2012 and effective January 28, 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:2012, final revised on December 27, 2012 and effective January 28, 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] 3.7dB (13.56006MHz, L) [AV] 0.7dB (13.56006MHz, l)	Complied	Conducted
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	70.9dB 13.56000MHz, QP, 90deg.	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	44.0dB 14.01000MHz, QP, 90deg.	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	1.1dB 339.000MHz, QP, Horizontal.	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

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FCC 15.31 (e)

This EUT provides stable voltage(DC5V) constantly to RF Part regardless of input voltage. Therefore, this 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 equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

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

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	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	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 report meets the limits unless the uncertainty is taken into consideration.

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

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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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	4.75 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 :

Mode	Remarks*
Tx 13.56MHz	The EUT Transmits and Receives at the same time and there is no receiving mode.
The EUT was operated in a manner similar to typical use during the tests. The EUT Transmits and Receives at the same time and there is no receiving mode.	

Test Item	Operating mode*
Electric Field Strength of Fundamental Emission	Tx Mod on, without Tag
Spectrum Mask	Tx Mod on, without Tag
20dB Bandwidth	Tx Mod on, without Tag
Electric Field Strength of Spurious Emission	Tx Mod on, without Tag
Frequency Tolerance	Tx Mod off

* Maximum Field Strength with Tag and without Tag were compared, the test was performed with the worst case.

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 : Normal Voltage DC 5V

Maximum Voltage DC 5.75V, Minimum Voltage DC 4.25V (DC 5V ±15%)

*This EUT provides stable voltage(DC 5V) constantly to RF Part regardless of input voltage

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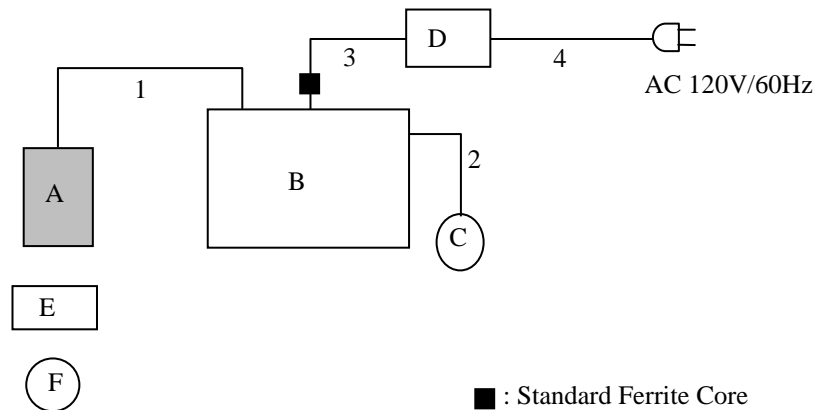
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4.2 Configuration and peripherals



* 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	RFID TAG Handy Reader Writer	SE1-HU	4661004100200010	DENSO WAVE INCORPORATED	EUT
B	Laptop PC	T61	L3R2056	lenovo	-
C	USB Mouse	TKOMSUK	060801039	SANWA SUPPLY	-
D	AC Adapter	92P1160	11S92P1160Z1ZBGH7B99A8	lenovo	-
E	Square type Tag	-	-	DENSO WAVE INCORPORATED	-
F	Cylinder type Tag	-	-	DENSO WAVE INCORPORATED	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	USB Cable	2.0	Shielded	Shielded	-
2	USB Cable	1.5	Shielded	Shielded	-
3	DC Cable	1.8	Unshielded	Unshielded	-
4	AC Cable	0.9	Unshielded	Unshielded	-

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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 : Tx 13.56MHz without tag

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 a CISPR average detector (CAV).

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

Detector Type : QP and CAV
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, 0.5m 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	PK	AV
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz

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

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

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

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

Measurement range : 0.009M-1GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Other test

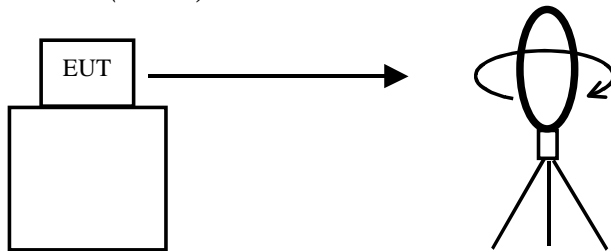
Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20dB Bandwidth	100kHz	3kHz	10kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 to 3% of Span	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter

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

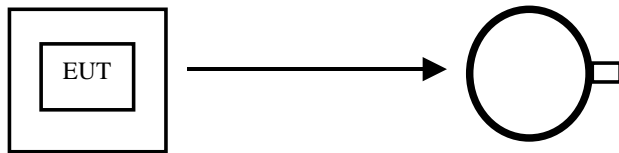
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

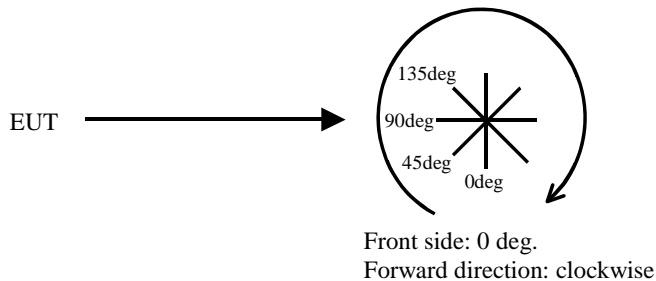


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



APPENDIX 1: Data of EMI test

Conducted emission

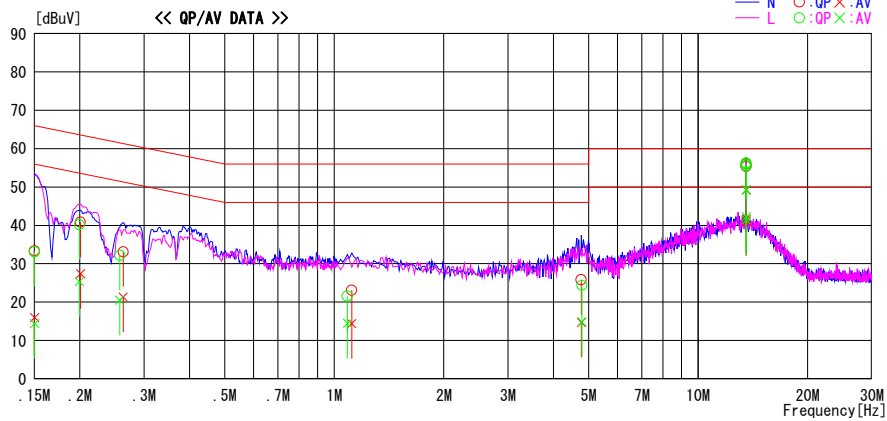
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
 Date : 2013/02/27

Report No. : 4786002526H
 Power : AC 120V / 60Hz
 Temp./Humi. : 25deg. C / 39% RH
 Engineer : Motoya Imura

Mode / Remarks : Tx 13.56MHz without tag

LIMIT : FCC15.207 QP
 FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	20.2	2.8	13.2	33.4	16.0	66.0	56.0	32.6	40.0	N	
0.15000	19.9	1.2	13.2	33.1	14.4	66.0	56.0	32.9	41.6	L	
0.19930	27.0	12.1	13.2	40.2	25.3	63.6	53.6	23.4	28.3	L	
0.20075	27.6	14.2	13.2	40.8	27.4	63.6	53.6	22.8	26.2	N	
0.25730	18.9	7.2	13.3	32.2	20.5	61.5	51.5	29.3	31.0	L	
0.26310	19.8	8.0	13.3	33.1	21.3	61.3	51.3	28.2	30.0	N	
1.08582	8.3	1.2	13.3	21.6	14.5	56.0	46.0	34.4	31.5	L	
1.11605	9.8	1.1	13.3	23.1	14.4	56.0	46.0	32.9	31.6	N	
4.77429	12.1	1.0	13.7	25.8	14.7	56.0	46.0	30.2	31.3	N	
4.78941	10.7	1.2	13.7	24.4	14.9	56.0	46.0	31.6	31.1	L	
13.55901	41.1	34.9	14.3	55.4	49.2	60.0	50.0	4.6	0.8	N	
13.55901	41.7	27.4	14.3	56.0	41.7	60.0	50.0	4.0	8.3	N	with Square Tag
13.55901	41.2	26.8	14.3	55.5	41.1	60.0	50.0	4.5	8.9	N	with Cylinder Tag
13.56006	41.2	35.0	14.3	55.5	49.3	60.0	50.0	4.5	0.7	L	
13.56006	42.0	27.9	14.3	56.3	42.2	60.0	50.0	3.7	7.8	L	with Square Tag
13.56006	41.6	27.1	14.3	55.9	41.4	60.0	50.0	4.1	8.6	L	with Cylinder Tag

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

*The limit is rounded down to one decimal place.

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

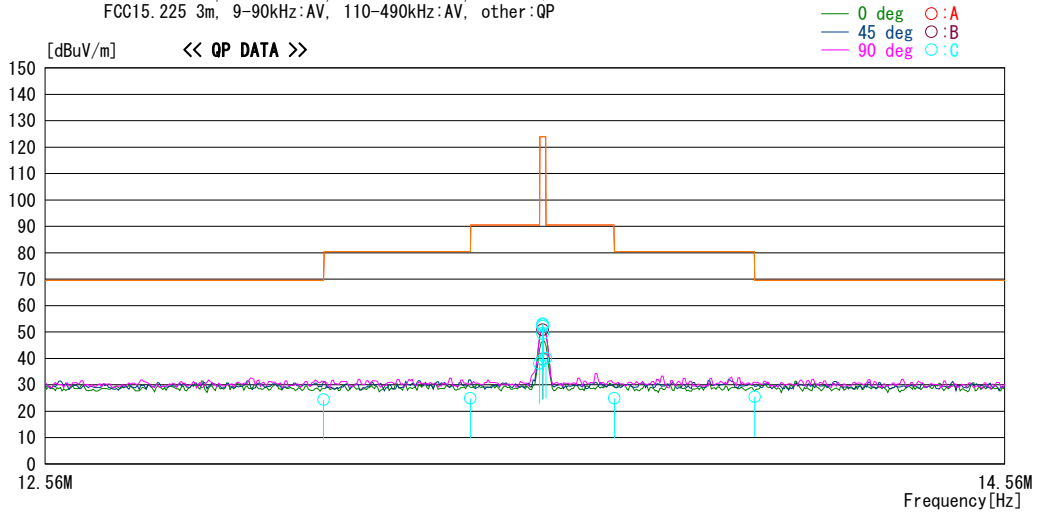
Fundamental emission and Spectrum Mask
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/02/24

Report No. : 4786002526H
Power : USB Bus Power
Temp. / Humi. : 21deg. C / 35% RH
Engineer : Takumi Shimada

Mode / Remarks : Tx 13.56MHz Worst axis Y , without tag

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]	
13.11000	30.4	QP	19.3	7.0	32.3	24.4	69.5	45.1	90	C	227
13.41000	30.8	QP	19.3	7.1	32.3	24.9	80.5	55.6	90	C	227
13.55300	44.0	QP	19.3	7.1	32.3	38.1	90.4	52.3	90	C	227
13.56000	45.6	QP	19.3	7.1	32.3	39.7	123.9	84.2	0	A	100
13.56000	56.7	QP	19.3	7.1	32.3	50.8	123.9	73.1	45	B	210
13.56000	58.9	QP	19.3	7.1	32.3	53.0	123.9	70.9	90	C	227
13.56000	55.3	QP	19.3	7.1	32.3	49.4	123.9	74.5	135	C	277
13.56000	45.4	QP	19.3	7.1	32.3	39.5	123.9	84.4	0	C	150
13.56000	58.7	QP	19.3	7.1	32.3	52.8	123.9	71.1	90	C	227
13.56000	58.1	QP	19.3	7.1	32.3	52.2	123.9	71.7	90	C	227
13.56700	45.9	QP	19.3	7.1	32.3	40.0	90.4	50.4	90	C	227
13.71000	30.7	QP	19.3	7.1	32.3	24.8	80.5	55.7	90	C	227
14.01000	31.4	QP	19.3	7.1	32.3	25.5	69.5	44.0	90	C	227

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.)

*The limit is rounded down to one decimal place.

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

Spurious emission

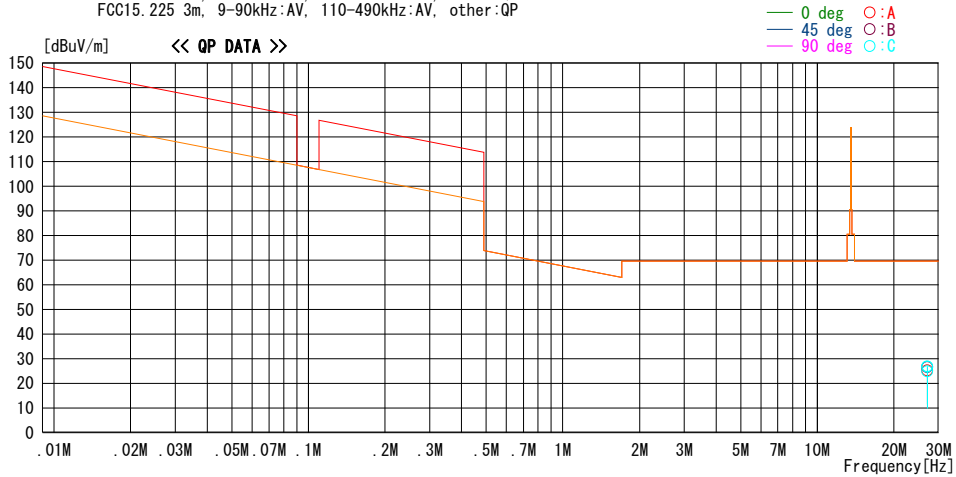
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/02/24

Report No. : 4786002526H
Power : USB Bus Power
Temp. / Humi. : 21deg. C / 35% RH
Engineer : Takumi Shimada

Mode / Remarks : Tx 13.56MHz Worst axis Y , without tag

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	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
			[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
27.12000	28.9	QP	20.9	7.5	32.2	25.1	69.5	44.4	0	A	320
27.12000	30.3	QP	20.9	7.5	32.2	26.5	69.5	43.0	45	B	204
27.12000	30.7	QP	20.9	7.5	32.2	26.9	69.5	42.6	90	C	110
27.12000	30.5	QP	20.9	7.5	32.2	26.7	69.5	42.8	135	C	108
27.12000	28.7	QP	20.9	7.5	32.2	24.9	69.5	44.6	0	C	300 Loop:Hori

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.)

*The limit is rounded down to one decimal place.

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

Spurious emission

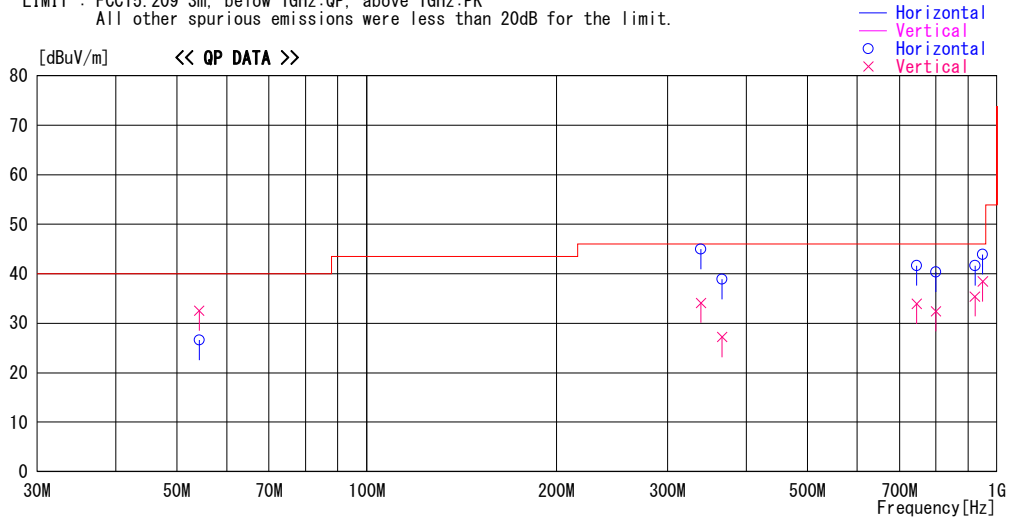
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/02/24

Report No. : 4786002526H
Power : USB Bus Power
Temp./Humi. : 21deg. C / 35% RH
Engineer : Takumi Shimada

Mode / Remarks : Tx 13.56MHz Worst axis(Hor:Z , Ver:Z) , without tag

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



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
54.240	38.7	QP	9.5	-21.6	26.6	312	371	Hori.	40.0	13.4	
54.240	44.6	QP	9.5	-21.6	32.5	33	100	Vert.	40.0	7.5	
339.000	48.3	QP	15.4	-18.8	44.9	289	100	Hori.	46.0	1.1	
339.000	37.5	QP	15.4	-18.8	34.1	94	100	Vert.	46.0	11.9	
366.120	41.5	QP	16.3	-18.9	38.9	322	100	Hori.	46.0	7.1	
366.120	29.8	QP	16.3	-18.9	27.2	180	100	Vert.	46.0	18.8	
745.800	38.1	QP	21.0	-17.5	41.6	129	110	Hori.	46.0	4.4	
745.800	30.4	QP	21.0	-17.5	33.9	151	153	Vert.	46.0	12.1	
800.040	35.5	QP	21.9	-17.1	40.3	117	100	Hori.	46.0	5.7	
800.040	27.6	QP	21.9	-17.1	32.4	353	142	Vert.	46.0	13.6	
922.080	35.5	QP	22.5	-16.4	41.6	285	100	Hori.	46.0	4.4	
922.080	29.3	QP	22.5	-16.4	35.4	209	117	Vert.	46.0	10.6	
949.200	37.3	QP	22.8	-16.2	43.9	276	100	Hori.	46.0	2.1	
949.200	31.8	QP	22.8	-16.2	38.4	197	100	Vert.	46.0	7.6	

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)

*The limit is rounded down to one decimal place.

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

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Head Office EMC Lab.

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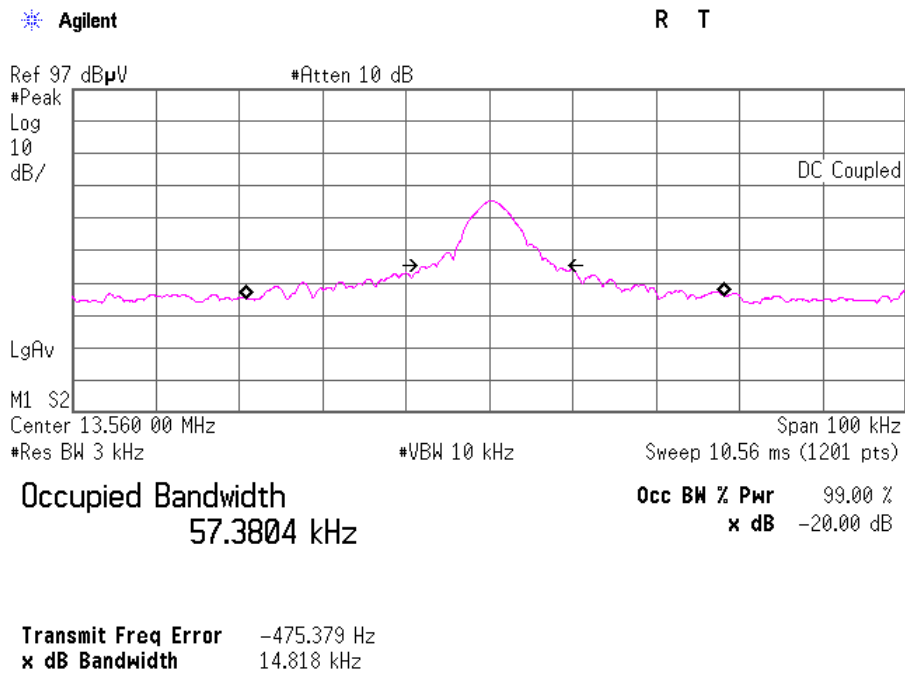
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20dB Bandwidth and 99% Occupied Bandwidth

Test place	Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No.	4786002526H
Date	02/24/2013
Temperature/ Humidity	21 deg.C / 35% RH
Engineer	Takumi Shimada
Mode	Tx Mod on without Tag

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	14.82	57.38



Frequency Tolerance

Test place : Head Office EMC Lab. No.6 measurement room
Report No. : 4786002526H-A
Date : 02/27/2013
Temperature/ Humidity : 24 deg.C / 39% RH
Engineer : Motoya Imura
Mode : Tx Mod on

Test Condition deg.C Volts		Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]
20deg.C	4.25V	Power on	13.56020920	0.00020920	15.43	100.00	84.57
		on 2min.	13.56020284	0.00020284	14.96	100.00	85.04
		on 5min.	13.56020435	0.00020435	15.07	100.00	84.93
		on 10min.	13.56020730	0.00020730	15.29	100.00	84.71
	5V	Power on	13.56020638	0.00020638	15.22	100.00	84.78
		on 2min.	13.56020386	0.00020386	15.03	100.00	84.97
		on 5min.	13.56020382	0.00020382	15.03	100.00	84.97
		on 10min.	13.56020384	0.00020384	15.03	100.00	84.97
	5.75V	Power on	13.56020777	0.00020777	15.32	100.00	84.68
		on 2min.	13.56020361	0.00020361	15.02	100.00	84.98
		on 5min.	13.56020155	0.00020155	14.86	100.00	85.14
		on 10min.	13.56020033	0.00020033	14.77	100.00	85.23
50deg.C.	5V	Power on	13.56020387	0.00020387	15.03	100.00	84.97
on 2min.		13.56020245	0.00020245	14.93	100.00	85.07	
on 5min.		13.56020258	0.00020258	14.94	100.00	85.06	
on 10min.		13.56020531	0.00020531	15.14	100.00	84.86	
40deg.C.		Power on	13.56020357	0.00020357	15.01	100.00	84.99
on 2min.		13.56020125	0.00020125	14.84	100.00	85.16	
on 5min.		13.56020383	0.00020383	15.03	100.00	84.97	
on 10min.		13.56020351	0.00020351	15.01	100.00	84.99	
30deg.C.		Power on	13.56020498	0.00020498	15.12	100.00	84.88
on 2min.		13.56020212	0.00020212	14.91	100.00	85.09	
on 5min.		13.56020389	0.00020389	15.04	100.00	84.96	
on 10min.		13.56020276	0.00020276	14.95	100.00	85.05	
20deg.C.		Power on	13.56020638	0.00020638	15.22	100.00	84.78
on 2min.		13.56020386	0.00020386	15.03	100.00	84.97	
on 5min.		13.56020382	0.00020382	15.03	100.00	84.97	
on 10min.		13.56020384	0.00020384	15.03	100.00	84.97	
10deg.C.		Power on	13.56020344	0.00020344	15.00	100.00	85.00
on 2min.		13.56020455	0.00020455	15.08	100.00	84.92	
on 5min.		13.56020386	0.00020386	15.03	100.00	84.97	
on 10min.		13.56020427	0.00020427	15.06	100.00	84.94	
0deg.C.		Power on	13.56024024	0.00024024	17.72	100.00	82.28
on 2min.		13.56023892	0.00023892	17.62	100.00	82.38	
on 5min.		13.56023455	0.00023455	17.30	100.00	82.70	
on 10min.		13.56024498	0.00024498	18.07	100.00	81.93	
-10deg.C.		Power on	13.56028174	0.00028174	20.78	100.00	79.22
on 2min.		13.56028238	0.00028238	20.82	100.00	79.18	
on 5min.		13.56028577	0.00028577	21.07	100.00	78.93	
on 10min.		13.56028762	0.00028762	21.21	100.00	78.79	
-20deg.C.		Power on	13.56029766	0.00029766	21.95	100.00	78.05
on 2min.		13.56029769	0.00029769	21.95	100.00	78.05	
on 5min.		13.56029622	0.00029622	21.85	100.00	78.15	
on 10min.		13.56029577	0.00029577	21.81	100.00	78.19	
-30deg.C.		Power on	13.56029868	0.00029868	22.03	100.00	77.97
on 2min.		13.56029888	0.00029888	22.04	100.00	77.96	
on 5min.		13.56029776	0.00029776	21.96	100.00	78.04	
on 10min.		13.56029524	0.00029524	21.77	100.00	78.23	

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)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2012/06/29 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2013/02/26 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2012/06/19 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2012/04/03 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2012/10/12 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/ 5D-2W(5m)/ 5D-2W(0.8m)/ 5D-2W(1m)	-	RE	2013/02/06 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2012/07/27 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2012/03/16 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2012/11/06 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2012/10/08 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2012/10/08 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2013/02/06 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2012/09/11 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	CE	2012/02/24 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	CE	2013/02/26 * 12
MJM-16	Measure	KOMELON	KMC-36	-	CE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	CE	2013/02/22 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	CE	2012/08/23 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE	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	2012/07/12 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2013/01/22 * 12
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	FT	2012/04/06 * 12
MCH-04	Temperature and Humidity Chamber	Tabai Espec	PL-2KP	14015723	FT	2012/08/01 * 12
MOS-14	Thermo-Hygrometer	Custom	CTH-201	-	FT	2013/02/26 * 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.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

**Test Item: CE: Conducted Emission
RE: Radiated Emission
FT: Frequency Tolerance**

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