



RADIO TEST REPORT

Test Report No. : 10874229H-A-R1

Applicant : Mitsubishi Electric Corporation Kyoto Works
Type of Equipment : Digital Color Printer
Model No. : CP-D90DW
Test regulation : FCC Part 15 Subpart C: 2015
FCC ID : BGBCP-D90DW
Test Result : Complied

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2. The results in this report apply only to the sample tested.
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4. The test results in this report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10874229H-A. 10874229H-A is replaced with this report.

Date of test: August 5 and 7, 2015

Representative test engineer:

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Engineer

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Approved by:

Takayuki Shimada

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Engineer

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NVLAP LAB CODE: 200572-0

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13-EM-F0429

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SECTION 1: Customer information

Company Name	:	Mitsubishi Electric Corporation Kyoto Works
Address	:	1 Zusho Baba Nagaokakyo-City Kyoto, 617-8550 Japan
Telephone Number	:	+81-75-958-3249
Facsimile Number	:	+81-75-958-3709
Contact Person	:	Tatsuya Egawa

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

2.1 Identification of E.U.T.

Type of Equipment	:	Digital Color Printer
Model No.	:	CP-D90DW
Serial No.	:	Refer to Clause 4.2
Rating	:	AC 100-240 V, 50/60 Hz
Receipt Date of Sample	:	August 5, 2015
Country of Mass-production	:	Malaysia
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	:	2.0 GHz (max.)
		Mechanical driving: 60 MHz

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	13.56 MHz
Modulation	:	ASK (ISO15693)
Bandwidth	:	140 kHz
Power Supply (radio part input)	:	DC 5.0 V
Antenna Type	:	Loop coil
Antenna Connector Type	:	Board to wire connector
Method of Frequency Generation	:	Quartz Crystal

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2015, final revised on September 8, 2015

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 September 8, 2015 does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted emission	ANSI C63.4:2009 7. AC powerline conducted emission measurements ----- <IC>RSS-Gen 8.8	Section 15.207 / 15.107(b) ----- <IC>RSS-Gen 8.8	[QP] 19.6 dB 13.56000 MHz, N [AV] 10.0 dB 15.96556 MHz, N	Complied	-
Electric Field Strength of Fundamental Emission	ANSI C63.4:2009 13. Measurement of intentional radiators ----- <IC> RSS-Gen 6.4, 6.12	Section 15.225(a) ----- <IC>RSS-210 A2.6	80.3 dB 13.56000 MHz, QP, 0 deg.	Complied	Radiated
Spectrum Mask	ANSI C63.4:2009 13. Measurement of intentional radiators ----- <IC>RSS-Gen 6.4, 6.13	Section 15.225(b)(c) ----- <IC> RSS-210 A2.6	45.9 dB 14.01000 MHz, QP, 0 deg.	Complied	Radiated
20dB Bandwidth	ANSI C63.4:2009 13. Measurement of intentional radiators ----- <IC> -	Section15.215(c) ----- <IC> -	See data	Complied	Radiated
Electric Field Strength of Spurious Emission	ANSI C63.4:2009 13. Measurement of intentional radiators ----- <IC>RSS-Gen 6.4, 6.13	Section 15.209, Section 15.225 (d) ----- <IC>RSS-210 A2.6	1.1 dB 35.850 MHz, Vertical, QP	Complied	Radiated
Frequency Tolerance	ANSI C63.4:2009 13. Measurement of intentional radiators ----- <IC>RSS-Gen 6.11, 8.11	Section 15.225(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)

This EUT provides stable voltage(DC 5.0 V) constantly to RF Module 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.

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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)
	150 kHz - 30 MHz
No.1	3.5 dB
No.2	3.5 dB
No.3	3.4 dB
No.4	3.5 dB

Test room (semi-anechoic chamber)	Radiated emission						
	(3 m*)(+dB)				(1 m*)(+dB)		(0.5 m*)(+dB)
	9 kHz - 30 MHz	30 MHz - 300 MHz	300 MHz - 1 GHz	1 GHz - 10 GHz	10 GHz - 18 GHz	18 GHz - 26.5 GHz	26.5 GHz - 40 GHz
No.1	4.3 dB	5.1 dB	6.2 dB	5.5 dB	5.8 dB	5.8 dB	4.3 dB
No.2	4.2 dB	5.1 dB	6.2 dB	5.4 dB	5.7 dB	5.9 dB	5.6 dB
No.3	4.4 dB	5.1 dB	6.3 dB	5.2 dB	5.5 dB	5.8 dB	5.5 dB
No.4	4.7 dB	5.3 dB	6.3 dB	5.3 dB	5.7 dB	5.9 dB	5.5 dB

*3 m / 1 m / 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 (3 m)

[Electric Field Strength of Fundamental Emission and Spectrum Mask]

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

[Electric Field Strength of Spurious Emission]

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

3.5 Test Location

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

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

3.6 Test set up, Test data, and Test instruments

Refer to APPENDIX.

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

4.1 Operating Modes

The mode is used :

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

Test Item	Operating mode*
Electric Field Strength of Fundamental Emission	Tx Mod on
Spectrum Mask	Tx Mod on
20dB Bandwidth	Tx Mod on
Electric Field Strength of Spurious Emission	Tx Mod on
Frequency Tolerance	Tx Mod on

* After the comparison of the test data between with Tag and without Tag, the tests were performed with Tag which was the worst case.

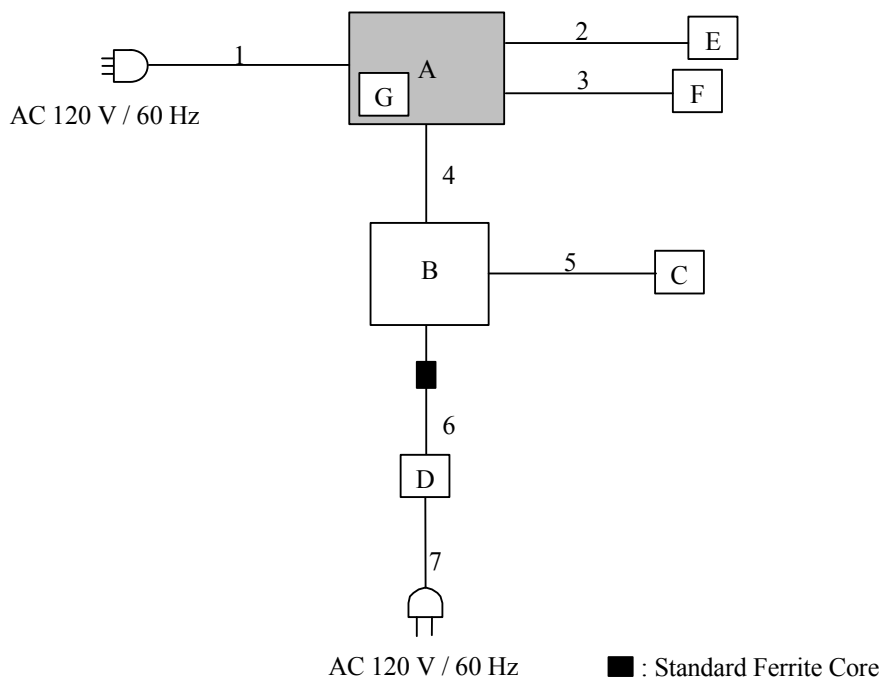
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

Frequency Tolerance:

Temperature : -20deg.C to +50deg.C Step 10deg.C
Voltage : Normal Voltage AC 120V
Maximum Voltage AC 138V
Minimum Voltage AC 102V
(AC 120V $\pm$ 15%)

*This EUT provides stable voltage (DC 5.0V) constantly to RF Part regardless of input voltage

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	Printer	CP-D90DW	ES2-03	MITSUBISHI ELECTRIC	EUT
B	Laptop PC	T410	R8-D74HD	Lenovo	-
C	Mouse	M-PGULBK1	04003122	ELECOM	-
D	AC Adapter	92P1160	11S92P1160212BGH 86PEAH	Lenovo	-
E	Dummy load	-	-	-	-
F	Dummy load	-	-	-	-
G	Cartridge Tag	-	-	MITSUBISHI ELECTRIC	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	AC Cable	1.8	Unshielded	Unshielded	-
2	DC Cable	0.9	Unshielded	Unshielded	-
3	USB Cable	0.5	Shielded	Shielded	-
4	USB Cable	3.0	Shielded	Shielded	-
5	USB Cable	1.0	Shielded	Shielded	-
6	DC Cable	1.8	Unshielded	Unshielded	-
7	AC Cable	0.8	Unshielded	Unshielded	-

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SECTION 5: Conducted emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber. The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

Detector	: QP and CISPR AV
Measurement range	: 0.15 MHz - 30 MHz
Test data	: APPENDIX
Test result	: Pass

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

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

Frequency: From 9 kHz to 30 MHz

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0 deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency: From 30 MHz to 1 GHz

The measuring antenna height varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	Below 30 MHz	30 MHz to 300 MHz	300 MHz to 1 GHz
Antenna Type	Loop	Biconical	Logperiodic

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

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

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

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane.

However test results were confirmed to pass against standard limit.

The test was made on EUT at the normal use position.

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

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

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SECTION 7: Other test

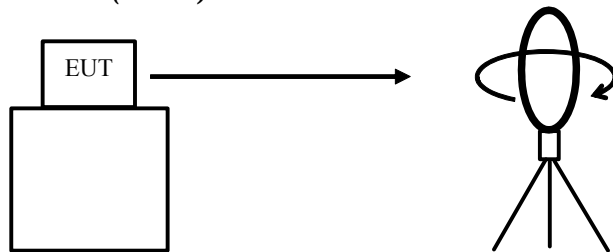
Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
20 dB Bandwidth	300 kHz	3 kHz	10 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer
Frequency Tolerance	-	-	-	-	-	-	Frequency counter

*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.
Peak hold was applied as Worst-case measurement.

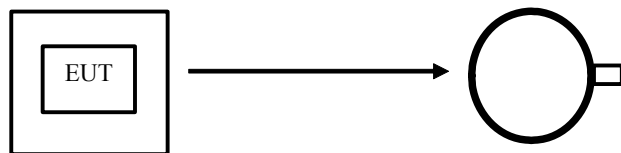
Test data : APPENDIX
Test result : Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

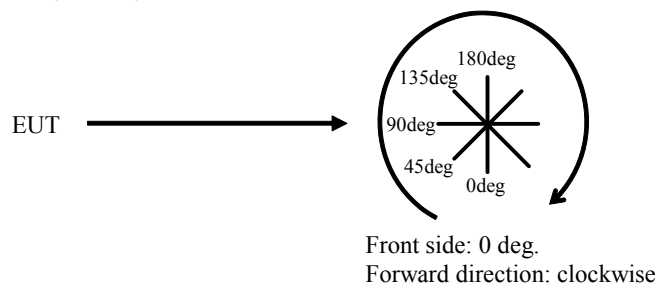


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



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APPENDIX 1: Data of EMI test

Conducted emission

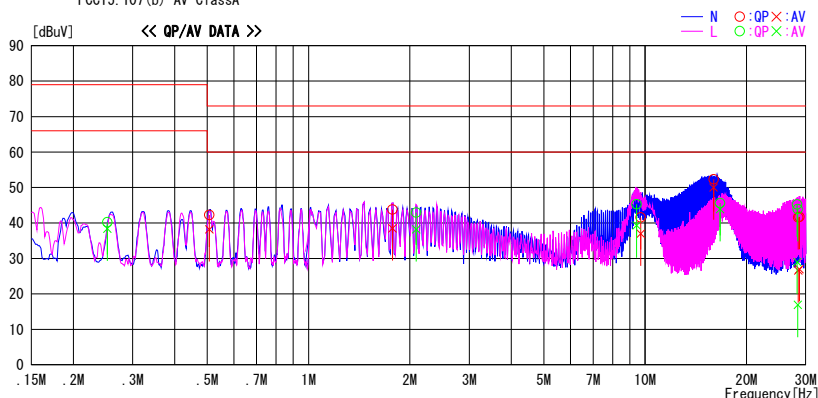
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2015/08/06

Report No. : 10874229H
Power : AC 120V / 60Hz
Temp./Humi. : 24deg. C / 61% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz with Tag

LIMIT : FCC15.107(b) QP ClassA
FCC15.107(b) AV ClassA



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]		
0.25255	27.0	25.2	13.2	40.2	38.4	79.0	66.0	38.8	27.6	L	
0.50695	29.1	25.0	13.2	42.3	38.2	73.0	60.0	30.7	21.8	N	
1.77483	30.3	25.0	13.5	43.8	38.5	73.0	60.0	29.2	21.5	N	
2.08784	29.4	24.7	13.5	42.9	38.2	73.0	60.0	30.1	21.8	L	
9.42400	31.1	25.1	14.2	45.3	39.3	73.0	60.0	27.7	20.7	L	
9.70063	27.4	22.8	14.2	41.6	37.0	73.0	60.0	31.4	23.0	N	
15.96556	37.7	35.4	14.6	52.3	50.0	73.0	60.0	20.7	10.0	N	
16.69549	30.9	29.2	14.7	45.6	43.9	73.0	60.0	27.4	16.1	L	
28.28861	29.9	13.7	15.3	45.2	29.0	73.0	60.0	27.8	31.0	L	
28.39750	28.6	1.6	15.3	43.9	16.9	73.0	60.0	29.1	43.1	L	
28.49875	26.3	11.3	15.3	41.6	26.6	73.0	60.0	31.4	33.4	N	
28.70615	26.4	11.7	15.3	41.7	27.0	73.0	60.0	31.3	33.0	N	

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

*For a limit of Conducted emission, the Section 15.107(b) Class A for the EMC noise and the Section 15.207 for 13.56 MHz were applied since this product was corresponded to Class A device based on the FCC15 subpart B. In addition, there are no differences in spurious emission of radio operation and EMC operation.

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Conducted emission

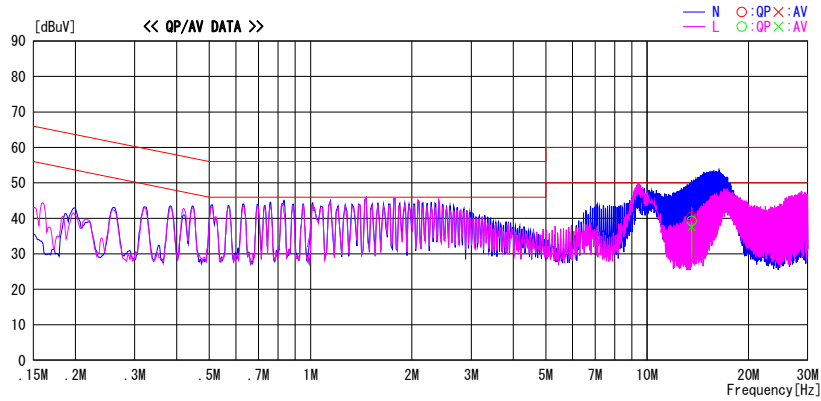
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2015/08/06

Report No. : 10874229H
Power : AC 120V / 60Hz
Temp./Humi. : 24deg. C / 61% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz with Tag

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dB]	AV [dB]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
13.56000	25.9	22.9	14.5	40.4	37.4	60.0	50.0	19.6	12.6	N	
13.56000	24.8	23.0	14.5	39.3	37.5	60.0	50.0	20.7	12.5	L	

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

Fundamental emission and Spectrum Mask

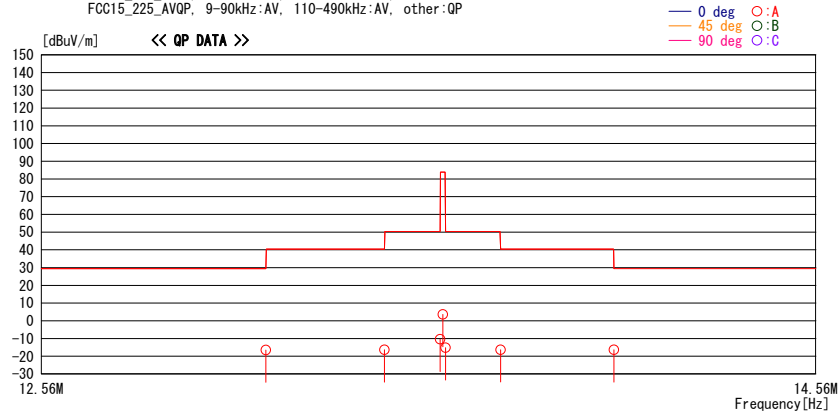
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No. 3 Semi Anechoic Chamber
Date : 2015/08/05

Report No. : 10874229H
Power : AC120V / 60Hz
Temp. / Humi. : 25deg. C / 54% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz With 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	29.7	QP	19.5	-33.4	32.3	-16.5	29.5	46.0	0	A	80
13.41000	29.9	QP	19.4	-33.4	32.3	-16.4	40.5	56.9	0	A	80
13.55300	35.9	QP	19.4	-33.4	32.3	-10.4	50.4	60.8	0	A	80
13.56000	49.9	QP	19.4	-33.4	32.3	3.6	83.9	80.3	0	A	80
13.56700	31.1	QP	19.4	-33.4	32.3	-15.2	50.4	65.6	0	A	80
13.71000	30.0	QP	19.4	-33.4	32.3	-16.3	40.5	56.8	0	A	80
14.01000	30.0	QP	19.3	-33.4	32.3	-16.4	29.5	45.9	0	A	80

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.)

Result of the fundamental emission at 3m without Distance factor

QP

Ant Deg [deg]	Frequency	Detector	Reading	Ant Factor	Loss	Gain	Duty Factor	Result	Limit	Margin	Remark
	[MHz]		[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
0	13.56000	QP	49.9	19.4	6.6	32.3	-	43.6	-	-	Fundamental

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

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Spurious emission

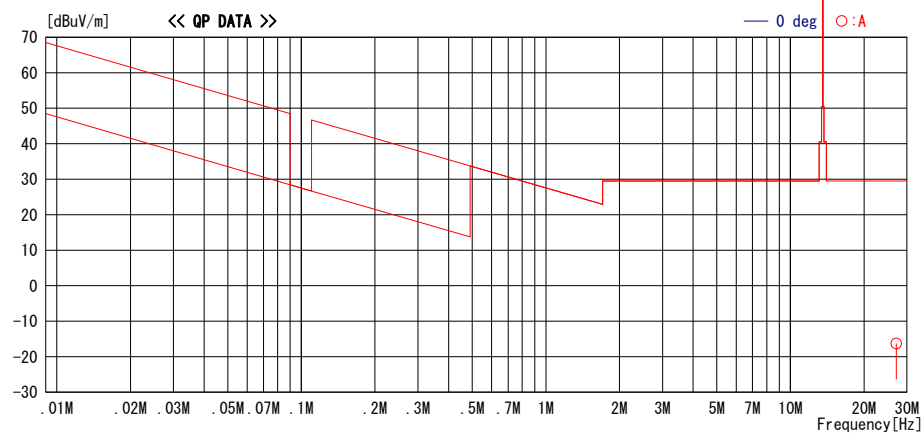
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/08/05

Report No. : 10874229H
Power : AC120V / 60Hz
Temp. / Humi. : 25deg. C / 54% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz With Tag

LIMIT : FCC15.209 PKQP, 9-90kHz:PK, 110-490kHz:PK, other:QP
FCC15.209 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	29.4	QP	19.7	-33.1	32.3	-16.3	29.5	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 + ATTN. + D.FACTOR) - GAIN (AMP.)

*All other spurious emissions were less than 20dB for the limit.

Spurious emission

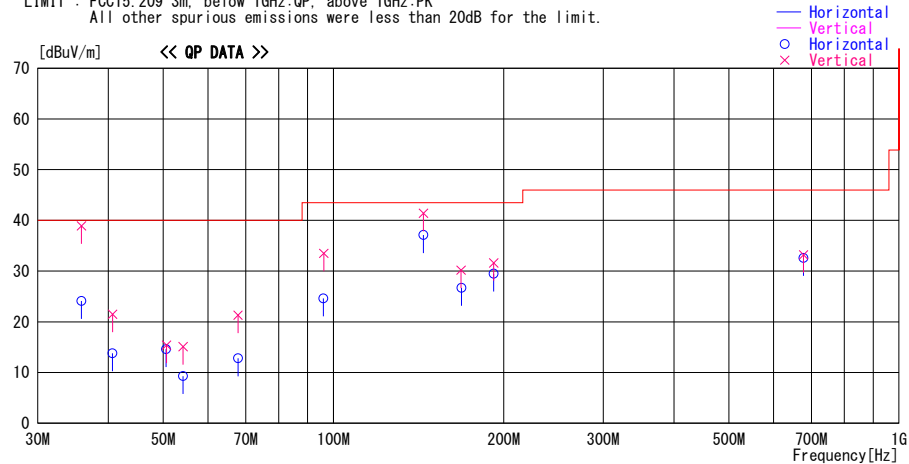
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2015/08/05

Report No. : 10874229H
Power : AC120V / 60Hz
Temp./Humi. : 25deg. C / 54% RH
Engineer : Tomohisa Nakagawa

Mode / Remarks : Tx 13.56MHz With Tag

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



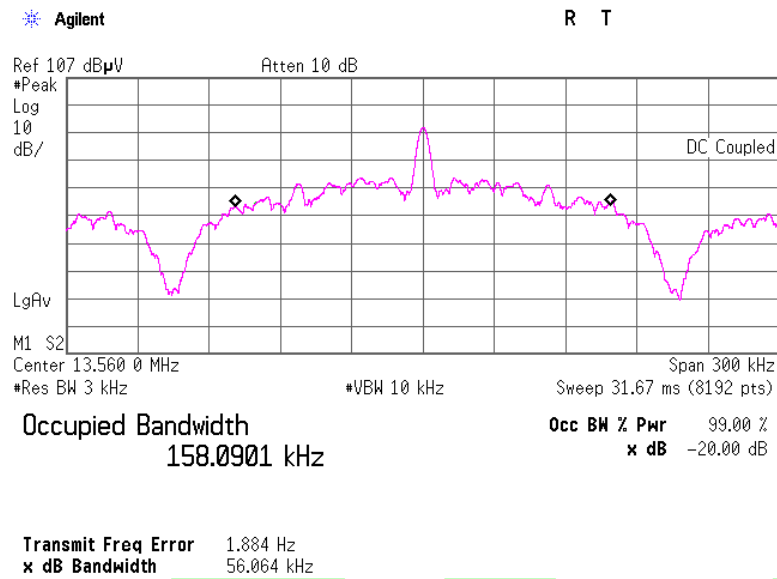
Frequency	Reading	DET	Antenna		Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Loss& Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
35.850	33.7	QP	15.6	-25.2	24.1	78	345	Hori.	40.0	15.9	
35.850	48.5	QP	15.6	-25.2	38.9	105	104	Vert.	40.0	1.1	
40.690	32.4	QP	14.1	-25.0	21.5	150	103	Vert.	40.0	18.5	
40.680	24.7	QP	14.1	-25.0	13.8	283	300	Hori.	40.0	26.2	
50.700	29.7	QP	10.5	-24.8	15.4	115	103	Vert.	40.0	24.6	
50.579	28.8	QP	10.6	-24.8	14.6	12	400	Hori.	40.0	25.4	
54.240	30.5	QP	9.3	-24.7	15.1	136	103	Vert.	40.0	24.9	
54.240	24.7	QP	9.3	-24.7	9.3	139	349	Hori.	40.0	30.7	
67.800	39.4	QP	6.4	-24.5	21.3	276	100	Vert.	40.0	18.7	
67.800	30.9	QP	6.4	-24.5	12.8	293	288	Hori.	40.0	27.2	
96.150	48.2	QP	9.5	-24.2	33.5	360	100	Vert.	43.5	10.0	
96.007	39.3	QP	9.5	-24.2	24.6	9	337	Hori.	43.5	18.9	
144.300	50.5	QP	14.6	-23.7	41.4	121	100	Vert.	43.5	2.1	
144.326	46.2	QP	14.6	-23.7	37.1	351	208	Hori.	43.5	6.4	
168.376	34.4	QP	15.8	-23.5	26.7	0	137	Hori.	43.5	16.8	
168.149	37.9	QP	15.8	-23.5	30.2	61	103	Vert.	43.5	13.3	
191.999	38.3	QP	16.4	-23.1	31.6	35	100	Vert.	43.5	11.9	
191.999	36.2	QP	16.4	-23.1	29.5	360	159	Hori.	43.5	14.0	
678.000	33.0	QP	20.2	-20.0	33.2	39	100	Vert.	46.0	12.8	
678.000	32.4	QP	20.2	-20.0	32.6	9	100	Hori.	46.0	13.4	

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

20dB Bandwidth and 99% Occupied Bandwidth

Test place	Ise EMC Lab. No.3 Measurement Room
Report No.	10874229H
Date	08/05/2015
Temperature/ Humidity	25 deg. C / 54 % RH
Engineer	Tomohisa Nakagawa
Mode	Tx 13.56MHz Mod on

FREQ [MHz]	20dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
13.56	56.06	158.09



Frequency Tolerance

Test place : Ise EMC Lab. No.11 Measurement Room
Report No. : 10874229H
Date : 08/07/2015
Temperature/ Humidity : 28 deg. C / 33% RH
Engineer : Yuta Moriya
Mode : Tx 13.56MHz CW

Test Condition deg.C Volts		Test Timing	Measured freq [MHz]	Freq error [MHz]	Result [ppm]	Limit (+/- 0.01%) [+/- ppm]	Margin [ppm]	
20deg.C	138V	Power on	13.560129	0.000129	9.50	100.00	90.50	
		on 2min.	13.560126	0.000126	9.27	100.00	90.73	
		on 5min.	13.560124	0.000124	9.17	100.00	90.83	
		on 10min.	13.560124	0.000124	9.18	100.00	90.82	
	120V	Power on	13.560132	0.000132	9.76	100.00	90.24	
		on 2min.	13.560126	0.000126	9.27	100.00	90.73	
		on 5min.	13.560123	0.000123	9.08	100.00	90.92	
		on 10min.	13.560123	0.000123	9.05	100.00	90.95	
	102V	Power on	13.560125	0.000125	9.18	100.00	90.82	
		on 2min.	13.560123	0.000123	9.10	100.00	90.90	
		on 5min.	13.560123	0.000123	9.10	100.00	90.90	
		on 10min.	13.560124	0.000124	9.15	100.00	90.85	
50deg.C.	120V	Power on	13.560055	0.000055	4.09	100.00	95.91	
		on 2min.	13.560051	0.000051	3.76	100.00	96.24	
		on 5min.	13.560050	0.000050	3.66	100.00	96.34	
		40deg.C.	on 10min.	13.560049	0.000049	3.59	100.00	96.41
Power on			13.560076	0.000076	5.59	100.00	94.41	
on 2min.			13.560067	0.000067	4.97	100.00	95.03	
on 5min.			13.560065	0.000065	4.82	100.00	95.18	
30deg.C.		on 10min.	13.560065	0.000065	4.80	100.00	95.20	
		Power on	13.560120	0.000120	8.82	100.00	91.18	
		on 2min.	13.560110	0.000110	8.09	100.00	91.91	
		on 5min.	13.560103	0.000103	7.56	100.00	92.44	
20deg.C.		on 10min.	13.560097	0.000097	7.19	100.00	92.81	
		Power on	13.560132	0.000132	9.76	100.00	90.24	
		on 2min.	13.560126	0.000126	9.27	100.00	90.73	
		on 5min.	13.560123	0.000123	9.08	100.00	90.92	
10deg.C.		on 10min.	13.560123	0.000123	9.05	100.00	90.95	
		Power on	13.560147	0.000147	10.87	100.00	89.13	
		on 2min.	13.560143	0.000143	10.58	100.00	89.42	
		on 5min.	13.560151	0.000151	11.17	100.00	88.83	
0deg.C.		on 10min.	13.560153	0.000153	11.31	100.00	88.69	
		Power on	13.560157	0.000157	11.61	100.00	88.39	
		on 2min.	13.560163	0.000163	12.05	100.00	87.95	
		on 5min.	13.560149	0.000149	10.97	100.00	89.03	
-10deg.C.		on 10min.	13.560149	0.000149	11.02	100.00	88.98	
		Power on	13.560124	0.000124	9.16	100.00	90.84	
		on 2min.	13.560139	0.000139	10.26	100.00	89.74	
		on 5min.	13.560144	0.000144	10.64	100.00	89.36	
-20deg.C		on 10min.	13.560146	0.000146	10.75	100.00	89.25	
		Power on	13.560085	0.000085	6.25	100.00	93.75	
		on 2min.	13.560106	0.000106	7.79	100.00	92.21	
		on 5min.	13.560116	0.000116	8.54	100.00	91.46	
			on 10min.	13.560121	0.000121	8.93	100.00	91.07
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.

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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/02/19 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2015/01/13 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	RE	2014/10/17 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2014/08/19 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2014/10/18 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2014/10/18 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2015/07/13 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2015/04/08 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2015/03/10 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2014/10/04 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/ SFM141(3m)/ sucoform141-PE(1m)/ 421-010(1.5m)/ RFM-E321(Switcher)	-/00640	RE	2015/07/02 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2015/06/24 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	CE	2015/07/01 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	CE	2015/01/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	CE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	CE	2014/11/12 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2015/06/08 * 12
MLS-23	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	CE(AE)	2015/07/10 * 12
MLS-24	LISN(AMN)	Schwarzbeck	NSLK8127	8127-730	CE(EUT)	2015/07/10 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2015/01/19 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D- 2W(5m)/5D- 2W(0.8m)/5D-2W(1m)	-	CE	2015/02/06 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2015/01/29 * 12
MFC-01	Microwave Counter	Advantest	R5373	120100309	FT	2014/08/11 * 12
MCH-06	Temperature and Humidity Chamber	Tabai Spec	PL-1KT	14007630	FT	2015/04/29 * 12
MLPA-07	Loop Antenna	UL Japan	-	-	FT	Pre Check
MOS-19	Thermo-Hygrometer	Custom	CTH-201	0001	FT	2014/12/22 * 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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