RADIO TEST REPORT

Test Report No.: 10614993S-A

Applicant	:	**MITSUMI ELECTRIC CO., LTD.**
Type of Equipment	:	**RFID Product**
Model No.	:	**CTR-012**
FCC ID	:	**POOCTR012**
Test regulation	:	**FCC Part15 Subpart C: 2015**
Test result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by any agency of the Federal Government.
6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: January 13 to 26, 2015

Tested by:

Hikaru Shirasawa
Engineer
Consumer Technology Division

Approved by :

Toyokazu Imamura
Leader
Consumer Technology Division

RTL02610

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

REVISION HISTORY

Original Test Report No.: 10614993S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10614993S-A	January 30, 2015	-	-

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

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SECTION 1: Customer information

Company Name	:	MITSUMI ELECTRIC CO., LTD.
Address	:	2-11-2 Tsurumaki, Tama-shi, Tokyo, 206-8567 Japan
Telephone Number	:	+81-42-310-5768
Facsimile Number	:	+81-42-310-5582
Contact Person	:	Hironori Matsunuma

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

2.1 Identification of E.U.T.

Type of Equipment	:	RFID Product
Model Number	:	CTR-012
Serial Number	:	Refer to Section 4.2
Rating	:	DC 3.0V (battery)
Country of Mass-production	:	China
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample	:	January 10, 2015
Modification of EUT	:	No modification by the test lab.

2.2 Product description

Model: CTR-012 (referred to as the EUT in this report) is a RFID Product.

The clock frequencies used in the EUT: 13MHz, 26MHz

<Radio part>

Radio Type	:	Transceiver
Frequency of Operation	:	13.56MHz
Modulation	:	ASK
Antenna type	:	Loop
ITU code	:	A1D
Operating Temperature	:	+5 to +35 deg C.
Card type	:	Type A / B / F

FCC 15.31 (e)
The test was performed with a new battery. Therefore, this EUT complies with the requirement.

FCC 15.203
The equipment and its antenna comply with this requirement since the antenna is built in the equipment and it cannot be replaced by end users.

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2015, final revised on January 21, 2015
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.215 Additional provisions to the general radiated emission limitations
Section 15.225 Operation within the band 13.110-14.010MHz

* The revision on January 21, 2015 does not affect the test specification applied to the EUT.

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2009 7. AC powerline conducted emission measurements	FCC 15.207	-	N/A *1)	-	N/A
Electric field strength of Fundamental emission	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.225 (a)	Radiated	N/A	55.5dB Polarization: Vertical	Complied
Electric field strength of Spurious emission (within the 13.110-14.010MHz band)	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.225 (b)(c)	Radiated	N/A	37.0dB Freq.: 13.553MHz Polarization: Vertical	Complied
Electric field strength of Spurious emission (outside of the 13.110-14.010MHz band)	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.209 FCC 15.225 (d)	Radiated	N/A	11.0dB Freq.: 40.68MHz Polarization: Vertical	Complied
20dB bandwidth	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.215 (c)	Radiated	N/A	-	-
Frequency tolerance	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.225 (e)	Radiated	N/A	-	Complied
*1) The test is not applicable since the EUT has no AC mains. Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422						

3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2009 13. Measurement of intentional radiators, RSS-Gen 6.6	-	Radiated	-	-
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

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

3.4 Uncertainty

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

Item	Frequency range	No.1 SAC[*1] /SR[*2] (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.5 dB	3.5 dB
	30MHz-300MHz	4.9 dB	4.9 dB	4.7 dB
	300MHz-1GHz	5.0 dB	5.0 dB	4.8 dB

*1: SAC=Semi-Anechoic Chamber
*2: SR= Shielded Room is applied besides radiated emission

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

Frequency tolerance
Frequency (Normal condition) Measurement uncertainty for this test was: (±) 7.9 x 10^-8.
Frequency (Extreme condition) Measurement uncertainty for this test was: (±) 7.9 x 10^-8.

Other tests
Bandwidth Measurement uncertainty for this test was: (±) 0.66%

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone number : +81 463 50 6400
Facsimile number : +81 463 50 6401
JAB Accreditation No. : RTL02610

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

3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 1 to 3.

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

4.1 Operating mode

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Operating mode	Tested frequency
All items	Transmitting	13.56MHz

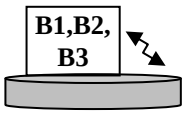
Software for testing: NFC Stack Test Tool Application, Version: 1.41, NFC Stack Build: 20791B2
Power setting: High) Hex Data = A9 03 00 08 20

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

Radiated emission (Carrier)	Radiated emission (Below 30MHz)	Radiated emission (Above 30MHz)
Without Tag (Type A)	Without Tag (Type A)	With Tag (Type B or Type F)

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

4.2 Configuration and peripherals



A: EUT

* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	RFID Product	CTR-012	DP2-A1090	MITSUMI	EUT
B1	Tag Type A	Cubic tag	-	-	-
B2	Tag Type B	-	-	-	-
B3	Tag Type F	-	-	-	-

SECTION 5: Radiated emission (Fundamental and Spurious emission)

5.1 Operating environment

The test was carried out in a semi-anechoic chamber.

Temperature : Refer to APPENDIX 1.
Humidity : Refer to APPENDIX 1.

5.2 Test configuration

EUT was placed on a polystyrene platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. Photographs of the set up are shown in Appendix 1.

5.3 Test conditions

Frequency range : 9kHz - 1GHz
Test distance : 3m
EUT position : Table top

5.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane at a distance of 3m.
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606. These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane. However test results were confirmed to pass against standard limit.

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3m
Frequency: From 9kHz to 30MHz at distance 3m
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: 0deg.to 360deg.) and horizontal polarization. Drawing of the antenna direction is shown in Figure 1.

Frequency: From 30MHz to 1GHz at distance 3m (Refer to Figure 2).
The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with QP, PK, and AV detector.

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

	9kHz to 90kHz & 110kHz to 150kHz	90kHz to 110kHz	150kHz to 490kHz	490kHz to 30MHz	30MHz to 1GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz
Measuring antenna	Loop antenna				Biconical (30-299.99MHz) Logperiodic (300MHz-1GHz)

* FCC 15.31 (f)(2) (9kHz-30MHz)
9kHz – 490kHz [Limit at 3m]= [Limit at 300m]-40log (3[m]/300[m])
490kHz – 30MHz [Limit at 3m]= [Limit at 30m]-40log (3[m]/30[m])

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT, and the test was made with the condition that has the maximum noise. Worst axis: Refer to the data.

5.5 Results

Summary of the test results : Pass

Refer to APPENDIX 1.

Figure 1. Direction of the Loop Antenna

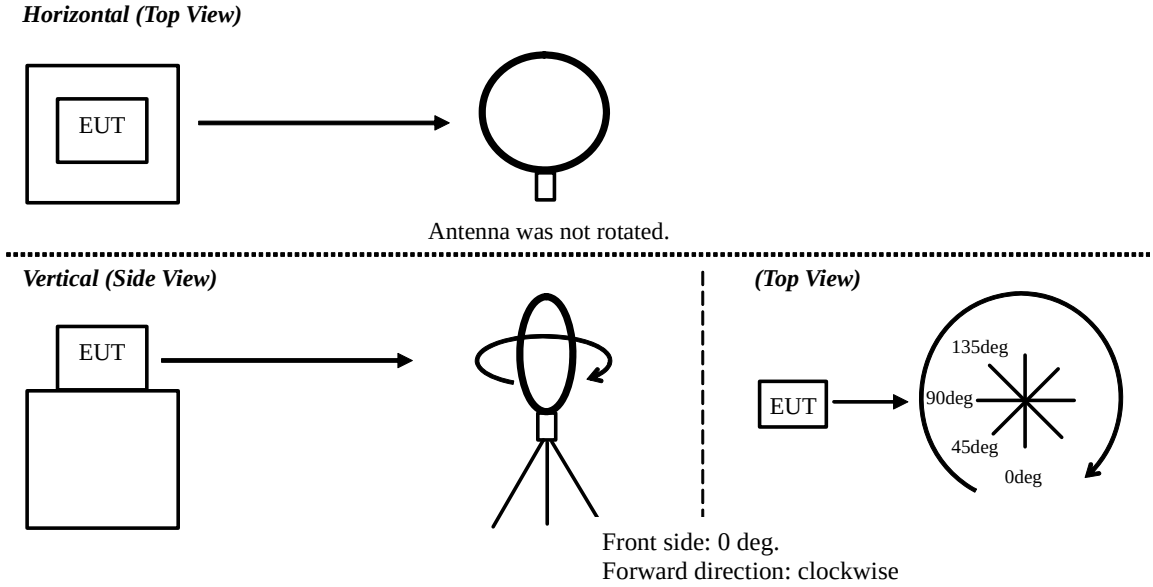
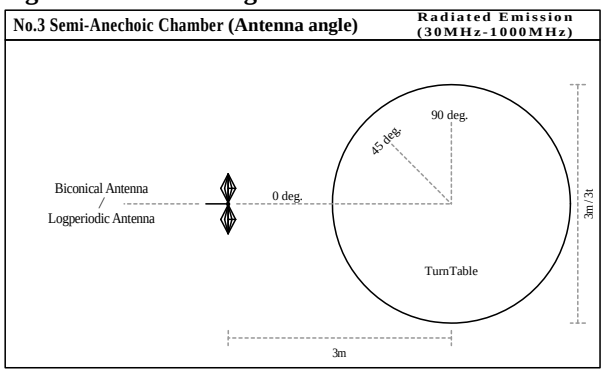


Figure 2. Antenna angle



SECTION 6: 20dB bandwidth & Occupied bandwidth (99%)

Test procedure

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

Results

Summary of the test results: Pass
Refer to APPENDIX 1.

SECTION 7: Frequency tolerances

Test procedure

The test was measured with a spectrum analyzer using a test fixture.
The temperature test was started after the temperature stabilization time of 30 minutes.
The test was begun from 50 deg.C and the temperature was lowered each 10 deg.C.

Results
Summary of the test results: Pass
Refer to APPENDIX 1.

Contents of APPENDIXES

APPENDIX 1: Data of radio tests

Data of Electric field strength of Fundamental emission and Spurious emission within the band: FCC15.225(a)(b)(c)

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

Company:	MITSUMI ELECTRIC CO., LTD.	Regulation:	FCC Part15 Subpart C 15.225
Equipment:	RFID Product	Test Distance:	3m
Model:	CTR-012	Date:	January 13, 2015
Sample No.:	DP2-A1090	Temperature:	19deg.C
Power:	DC3V (battery)	Humidity:	20%RH
Mode:	Transmitting 13.56MHz	ENGINEER:	Kenichi Adachi

Remarks: : Type A (Axis:Hor: Y / Ver: Y) , Vertical polarization (antenna angle) of the worst case: 0deg
without tag (type A)

Fundamental emission

No.	FREQ	Test Receiver Reading		Antenna Factor	Loss	AMP GAIN	Distance factor	RESULT		LIMIT (30m)	MARGIN		Turn Table	
		Hor	Ver					Hor	Ver		Hor	Ver	Hor	Ver
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	[deg.]	[deg.]
1	13.560	65.2	75.7	18.6	6.3	32.2	-40.0	17.9	28.4	83.9	66.0	55.5	179	0

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

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

Limits (30m)

・13.553MHz to 13.567MHz : 83.9dBuV/m (FCC 15.225(a))

Spurious emission within the band

No.	FREQ	Test Receiver Reading		Antenna Factor	Loss	AMP GAIN	Distance factor	RESULT		LIMIT (30m)	MARGIN	
		Hor	Ver					Hor	Ver		Hor	Ver
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]
1	13.110	30.8	30.0	18.6	6.3	32.2	-40.0	-16.5	-17.3	29.5	46.0	46.8
2	13.349	30.9	30.0	18.6	6.3	32.2	-40.0	-16.4	-17.3	40.5	56.9	57.8
3	13.410	30.8	30.0	18.6	6.3	32.2	-40.0	-16.5	-17.3	40.5	57.0	57.8
4	13.553	50.7	60.7	18.6	6.3	32.2	-40.0	3.4	13.4	50.4	47.0	**37.0**
5	13.567	50.6	60.6	18.6	6.3	32.2	-40.0	3.3	13.3	50.4	47.1	37.1
6	13.710	30.8	30.1	18.5	6.3	32.2	-40.0	-16.6	-17.3	40.5	57.1	57.8
7	13.773	30.8	30.1	18.5	6.3	32.2	-40.0	-16.6	-17.3	40.5	57.1	57.8
8	14.010	30.9	30.1	18.5	6.3	32.2	-40.0	-16.5	-17.3	29.5	46.0	46.8

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

Outside filed strength frequencies

・Fc±7kHz:13.553MHz to 13.567MHz

・Fc±150kHz:13.410MHz to 13.710MHz

・Fc±450kHz:13.110MHz to 14.010MHz

Fc = 13.56MHz

Limits (30m)

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

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

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

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220
Telephone :+81 463 50 6400
Facsimile : +81 463 50 6401

Radiated Emission

UL Japan, Inc.
Shonan EMC Lab. No.2 and No.3 Semi Anechoic Chamber

Company:	MITSUMI ELECTRIC CO., LTD.	Regulation:	FCC Part15 Subpart C 15.225	
Equipment:	RFID Product	Test Distance:	3m	
Model:	CTR-012	Date:	January 13, 2015	January 17, 2015
Sample No.:	DP2-A1090	Temperature:	19deg.C	23 deg.C
Power:	DC3V (battery)	Humidity:	20%RH	32 %RH
Mode:	Transmitting 13.56MHz	ENGINEER:	Kenichi Adachi	Shinichi Takano
EUT axis:	Below 30MHz(Horizontal Y-axis, Vertical Y-axis), NFC type A, without Tag		(Below 30MHz)	(Above 30MHz)
	Above 30MHz(Horizontal: X-axis, Vertical: Y-axis), NFC type B or F (See Remarks), with Tag		(No.3 SAC)	(No.2 SAC)

Remarks:

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	27.12	QP	29.7	19.4	6.5	32.2	-40.0	-16.6	29.5	46.1	-	0	* Limit: 30m
Hori.	40.68	QP	31.3	14.1	7.0	31.9	0.0	20.5	40.0	19.5	216	214	type B
Hori.	54.24	QP	27.2	9.5	7.2	31.9	0.0	12.0	40.0	28.0	198	99	type B
Hori.	67.80	QP	35.0	6.6	7.1	31.9	0.0	16.8	40.0	23.2	254	311	type B
Hori.	81.36	QP	24.8	6.5	8.0	31.9	0.0	7.4	40.0	32.6	211	105	type B
Hori.	94.92	QP	40.3	9.1	8.0	31.9	0.0	25.5	43.5	18.0	181	359	type B
Hori.	108.48	QP	27.3	11.3	7.9	31.9	0.0	14.6	43.5	28.9	270	302	type B
Hori.	122.04	QP	41.9	13.0	7.9	31.9	0.0	30.9	43.5	12.6	151	274	type F
Hori.	135.60	QP	26.7	14.0	8.2	31.8	0.0	17.1	43.5	26.4	222	308	type B
Hori.	827.16	QP	35.9	21.2	9.1	31.3	0.0	34.9	46.0	11.1	100	49	type B
Vert.	27.12	QP	29.7	19.4	6.5	32.2	-40.0	-16.6	29.5	46.1	-	0	* Limit: 30m
Vert.	40.68	QP	39.8	14.1	7.0	31.9	0.0	29.0	40.0	**11.0**	100	216	type B
Vert.	54.24	QP	31.5	9.5	7.2	31.9	0.0	16.3	40.0	23.7	100	42	type B
Vert.	67.80	QP	37.1	6.6	7.1	31.9	0.0	18.9	40.0	21.1	100	36	type B
Vert.	81.36	QP	25.2	6.5	8.0	31.9	0.0	7.8	40.0	32.2	139	37	type B
Vert.	94.92	QP	42.1	9.1	8.0	31.9	0.0	27.3	43.5	16.2	100	41	type B
Vert.	108.48	QP	27.5	11.3	7.9	31.9	0.0	14.8	43.5	28.7	100	48	type B
Vert.	122.04	QP	41.5	13.0	7.9	31.9	0.0	30.5	43.5	13.0	100	44	type F
Vert.	135.60	QP	25.7	14.0	8.2	31.8	0.0	16.1	43.5	27.4	113	233	type B

Result = Reading + Ant Factor + Loss (Cable+ATT+ΔAF(above 30MHz)) - Gain(Amprifier) + Distance factor(below 30MHz)

* Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

* Carrier level (Result at 3m): Hor= 57.9dBuV/m, Ver= 68.4 dBuV/m

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220
Telephone :+81 463 50 6400
Facsimile : +81 463 50 6401

Data of Frequency Tolerance

UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded room

Company	MITSUMI ELECTRIC CO., LTD.		
Equipment	RFID Product	Regulation	FCC Part15 Subpart C 15.225 (e)
Model	CTR-012	Date	January 19, 2015
Serial No.	DP2-A1090	Temperature	24 deg.C
Power	DC 3V	Humidity	37 %RH
Mode	Transmitting 13.56 MHz	ENGINEER	Hikaru Shirasawa

Temperature Variation: -20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency torerance (%)	Limit (%)
startup	13.56	13.559879	-0.000121	-0.00089	0.010
after 2minutes	13.56	13.559943	-0.000057	-0.00042	0.010
after 5minutes	13.56	13.559945	-0.000055	-0.00041	0.010
after 10minutes	13.56	13.559944	-0.000056	-0.00041	0.010

Temperature Variation: -10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency torerance (%)	Limit (%)
startup	13.56	13.559923	-0.000077	-0.00057	0.010
after 2minutes	13.56	13.559975	-0.000025	-0.00018	0.010
after 5minutes	13.56	13.559976	-0.000024	-0.00018	0.010
after 10minutes	13.56	13.559977	-0.000023	-0.00017	0.010

Temperature Variation: 0deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency torerance (%)	Limit (%)
startup	13.56	13.559965	-0.000035	-0.00026	0.010
after 2minutes	13.56	13.559988	-0.000012	-0.00009	0.010
after 5minutes	13.56	13.559989	-0.000011	-0.00008	0.010
after 10minutes	13.56	13.559990	-0.000010	-0.00007	0.010

Temperature Variation: 10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency torerance (%)	Limit (%)
startup	13.56	13.559984	-0.000016	-0.00012	0.010
after 2minutes	13.56	13.559992	-0.000008	-0.00006	0.010
after 5minutes	13.56	13.559993	-0.000007	-0.00005	0.010
after 10minutes	13.56	13.559994	-0.000006	-0.00004	0.010

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency torerance (%)	Limit (%)
startup	13.56	13.559990	-0.000010	-0.00007	0.010
after 2minutes	13.56	13.559993	-0.000007	-0.00005	0.010
after 5minutes	13.56	13.559994	-0.000006	-0.00004	0.010
after 10minutes	13.56	13.559995	-0.000005	-0.00004	0.010

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Data of Frequency Tolerance

Temperature Variation: 30deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency torerance (%)	Limit (%)
startup	13.56	13.559990	-0.000010	-0.00007	0.010
after 2minutes	13.56	13.559999	-0.000001	-0.00001	0.010
after 5minutes	13.56	13.560000	0.000000	0.00000	0.010
after 10minutes	13.56	13.560000	0.000000	0.00000	0.010

Temperature Variation: 40deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency torerance (%)	Limit (%)
startup	13.56	13.559995	-0.000005	-0.00004	0.010
after 2minutes	13.56	13.560015	0.000015	0.00011	0.010
after 5minutes	13.56	13.560018	0.000018	0.00013	0.010
after 10minutes	13.56	13.560018	0.000018	0.00013	0.010

Temperature Variation: 50deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency torerance (%)	Limit (%)
startup	13.56	13.560004	0.000004	0.00003	0.010
after 2minutes	13.56	13.560046	0.000046	0.00034	0.010
after 5minutes	13.56	13.560052	0.000052	0.00038	0.010
after 10minutes	13.56	13.560055	0.000055	0.00041	0.010

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Data of Frequency Tolerance

UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded room

Company	MITSUMI ELECTRIC CO., LTD.		
Equipment	RFID Product	Regulation	FCC Part15 Subpart C 15.225 (e)
Model	CTR-012	Date	January 19, 2015
Serial No.	DP2-A1090	Temperature	24 deg.C
Power	DC 3V	Humidity	37 %RH
Mode	Transmitting 13.56 MHz	ENGINEER	Hikaru Shirasawa

Voltage Variation: DC 2.55 V
Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency torerance (%)	Limit (%)
startup	13.56	13.559990	-0.000010	-0.00007	0.010
after 2minutes	13.56	13.559994	-0.000006	-0.00004	0.010
after 5minutes	13.56	13.559994	-0.000006	-0.00004	0.010
after 10minutes	13.56	13.559995	-0.000005	-0.00004	0.010

Voltage Variation: DC 3.45 V
Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency torerance (%)	Limit (%)
startup	13.56	13.559992	-0.000008	-0.00006	0.010
after 2minutes	13.56	13.559996	-0.000004	-0.00003	0.010
after 5minutes	13.56	13.559996	-0.000004	-0.00003	0.010
after 10minutes	13.56	13.559997	-0.000003	-0.00002	0.010

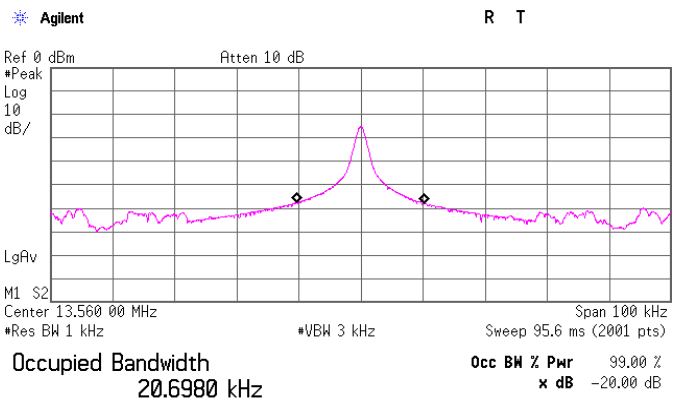
UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

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

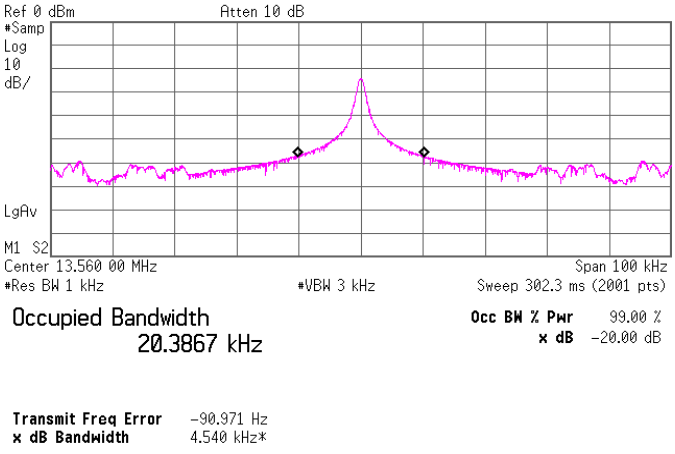
UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded Room

Company:	MITSUMI ELECTRIC CO., LTD.	Regulation:	FCC Part15 Subpart C 15.215
Equipment:	RFID Product		
Model:	CTR-012	Date:	January 19, 2015
Sample No.:	DP2-A1090	Temperature:	24 deg.C
Power:	DC3V (battery)	Humidity:	37 %RH
Mode:	Transmitting 13.56MHz : Type A	ENGINEER:	Hikaru Shirasawa

20dB Bandwidth: 4.889 kHz



99% Occupied Bandwidth: 20.387 kHz



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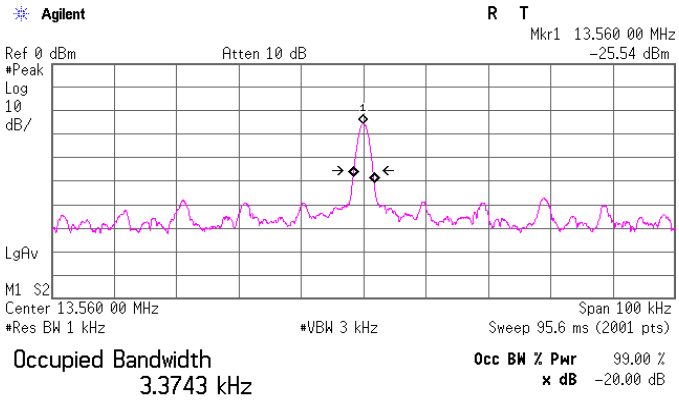
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220
Telephone :+81 463 50 6400
Facsimile : +81 463 50 6401

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

UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded Room

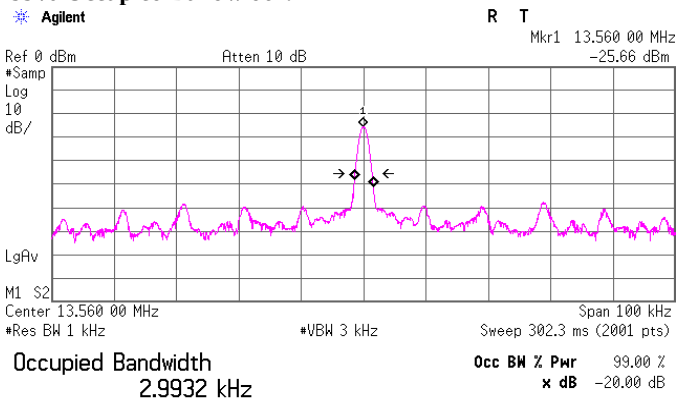
Company:	MITSUMI ELECTRIC CO., LTD.	Regulation:	FCC Part15 Subpart C 15.215
Equipment:	RFID Product		
Model:	CTR-012	Date:	January 26, 2015
Sample No.:	DP2-A1090	Temperature:	23 deg.C
Power:	DC3V (battery)	Humidity:	31 %RH
Mode:	Transmitting 13.56MHz	ENGINEER:	Hikaru Shirasawa
	: Type B		

20dB Bandwidth: 3.061 kHz



Transmit Freq Error	20.610 Hz
x dB Bandwidth	3.061 kHz

99% Occupied Bandwidth: 2.993 kHz



Transmit Freq Error	48.596 Hz
x dB Bandwidth	2.724 kHz*

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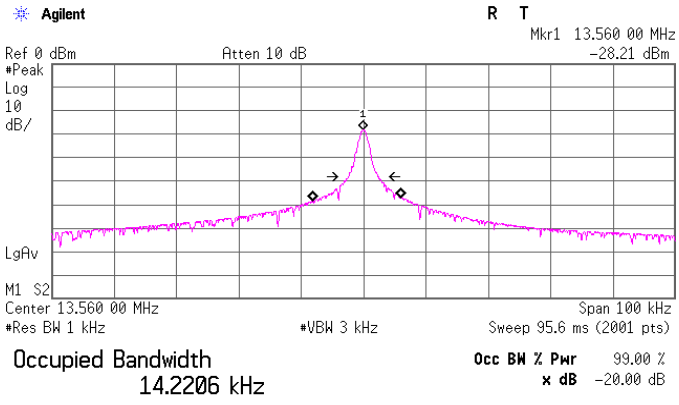
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220
Telephone :+81 463 50 6400
Facsimile : +81 463 50 6401

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

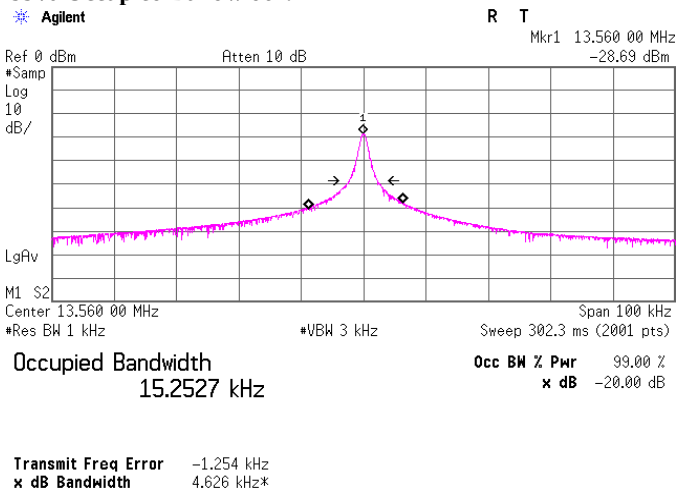
UL Japan, Inc.
Shonan EMC Lab. No.5 Shielded Room

Company:	MITSUMI ELECTRIC CO., LTD.	Regulation:	FCC Part15 Subpart C 15.215
Equipment:	RFID Product		
Model:	CTR-012	Date:	January 26, 2015
Sample No.:	DP2-A1090	Temperature:	23 deg.C
Power:	DC3V (battery)	Humidity:	31 %RH
Mode:	Transmitting 13.56MHz	ENGINEER:	Hikaru Shirasawa
	: Type F		

20dB Bandwidth: 4.908 kHz



99% Occupied Bandwidth: 15.253 kHz



UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa, Japan 259-1220
Telephone :+81 463 50 6400
Facsimile : +81 463 50 6401

APPENDIX 2
Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2014/07/14 * 12
SAEC-ALL	Semi Anechoic Chamber(ME)	TDK	Semi Anechoic Chamber 3m/10m	1, 2, 3	RE	2014/12/26 * 24
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2014/11/30 * 12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2014/02/17 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2014/04/25 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2014/02/14 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2014/03/04 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2014/10/30 * 12
SJM-15	Measure	ASKUL	-	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2014/02/17 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2014/02/17 * 12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2014/08/27 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2014/11/22 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2014/04/25 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2014/04/25 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2014/11/22 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2014/10/30 * 12
STR-07	Test Receiver	Rohde & Schwarz	ESU26	100484	RE	2014/09/03 * 12
SJM-14	Measure	ASKUL	-	-	RE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2014/07/08 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	TF	2014/02/03 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	TF	2014/03/17 * 12
SFC-01	Microwave Counter	Agilent	53151A	US40511493	TF	2014/04/01 * 12
SCH-01	Temperature and Humidity Chamber	Espec	PL-1KT	14020837	TF	2014/04/15 * 12
SSCA-01	Search coil	LANGER	RF-R 400-1	02-0634	TF	Pre Check
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	TF	2014/12/24 * 12

The expiration date of the calibration is the end of the expired month .
As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards.
Test Item :
RE: Radiated emission,
TF: Test Fixture tests,