



RADIO TEST REPORT

Test Report No.: 11445293S-A-R1

Applicant : Duplo Corporation
Type of Equipment : Multi-Protocol R/W module
Model No. : PC-1080301S
FCC ID : 2AJ6GA1
Test regulation : FCC Part 15 Subpart C: 2016
Test result : Complied

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7. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
8. This report is a revised version of 11445293S-A. 11445293S-A is replaced with this report.

Date of test:

October 3 to 17, 2016

Representative test engineer:

Makoto Hosaka

Engineer

Consumer Technology Division

Approved by :

Toyokazu Imamura

Leader

Consumer Technology Division



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
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13-EM-F0429

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SECTION 1: Customer information

Company Name : Duplo Corporation
Address : 4-1-6 Oyama, Chuo-ku, Sagamihara-shi, Kanagawa 252-5280 Japan
Telephone Number : +81 42 775 3620
Facsimile Number : +81 42 775 3621
Contact Person : Hiroaki Furuya

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

2.1 Identification of E.U.T.

Type of Equipment : Multi-Protocol R/W module
Model No. : PC-1080301S
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 5 V
Receipt Date of Sample : September 12, 2016
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

Model: PC-1080301S (referred to as the EUT in this report) is a Multi-Protocol R/W module.

The clock frequencies used in the EUT : 13.56 MHz

Radio Specification

Equipment type : Transceiver
Frequency of operation : 13.56 MHz
Type of modulation : ASK
ITU code : A1D

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C
FCC part 15 final revised on April 6, 2016.
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 13.110-14.010 MHz

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 8.8	FCC 15.207 ----- <IC> RSS-Gen 8.8	-	N/A	18.8 dB Freq.: 0.51009 MHz Phase: N	Complied
Electric field strength of Fundamental emission	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 6.4, 6.12	FCC 15.225 (a) ----- <IC> RSS-210 B.6	Radiated	N/A	55.98 dB Polarization: Vertical	Complied
Electric field strength of Spurious emission (within the 13.110-14.010 MHz band)	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 6.4, 6.13	FCC 15.225 (b)(c) ----- <IC> RSS-210 B.6	Radiated	N/A	36.25 dB Freq.: 13.553 MHz Polarization: Vertical	Complied
Electric field strength of Spurious emission (outside of the 13.110-14.010 MHz band)	ANSI C63.10:2013 6 Standard test methods <IC>RSS-Gen 6.4, 6.13	FCC 15.209 FCC 15.225 (d) ----- <IC> RSS-210 B.6	Radiated	N/A	2.1 dB Freq.: 583.073 MHz Polarization: Vertical	Complied
20dB bandwidth	ANSI C63.10:2013 6 Standard test methods <IC> -	FCC 15.215 (c) ----- <IC> -	Radiated	N/A	-	-
Frequency tolerance	ANSI C63.10:2013 6 Standard test methods <IC> RSS-Gen 6.11, 8.11	FCC 15.225 (e) ----- <IC> RSS-210 B.6	Radiated	N/A	-	Complied

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

FCC Part 15.31 (e)

The RF Module has its own regulators. The RF Module is constantly provided voltage (DC 5 V or DC 3.3 V) through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement.

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99 %)	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 $k = 2$.
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Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.1 dB	2.1 dB	2.6 dB	2.2 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	2.7 dB	2.7 dB	3.1 dB	-
	30 MHz-300 MHz	4.4 dB	4.4 dB	4.6 dB	-
	300 MHz-1 GHz	5.6 dB	5.5 dB	5.3 dB	-
	1 GHz-13 GHz	5.2 dB	5.2 dB	5.2 dB	-
Radiated emission (Measurement distance: 1 m)	13 GHz-18 GHz	4.9 dB	4.9 dB	4.9 dB	-
	18 GHz-40 GHz	4.9 dB	4.9 dB	4.9 dB	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Bandwidth Measurement	0.66 %
Duty cycle and Time Measurement	0.012 %

Conducted emission

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

Radiated emission

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

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3.5 Test location

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JAB Accreditation No. RTL02610

Test site	IC Registration Number	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.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
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.

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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	13.56 MHz

Software: PC-1080301 Software

Power settings: Fixed

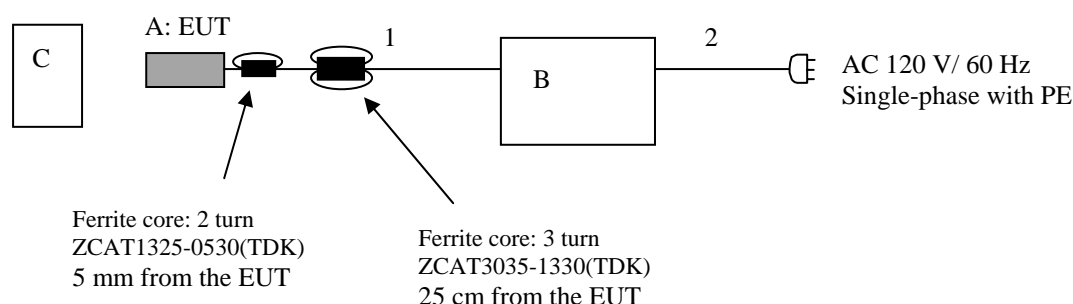
The carrier level and noise levels were confirmed with and without Tag, and the test was made with the condition that has the maximum noise.

Combinations of the worst case:

Radiated emission (Carrier)	Radiated emission (Below 30 MHz)	Radiated emission (Above 30 MHz)
Without Tag	Without Tag	With Tag

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

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Multi-Protocol R/W module	PC-1080301S	*1)	Duplo Corporation	EUT
B	Jig	-	-	Duplo Corporation	-
C	Tag	-	-	Duplo Corporation	ISO15693

*1) No.5 (Fundamental of Conducted emission), No.2 (other Conducted emission and Radiated emission), No.3 (Bandwidth and Frequency tolerances)

List of cables used

No.	Name	Length (m)	Shield- Cable	Shield- Connector	Remarks
1	Signal	1.7	Unshielded	Unshielded	*2)
2	AC	2.2	Unshielded	Unshielded	-

*2) PC-1080301S is marketed with this cable and ferrite cores as an end product.

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SECTION 5: Conducted emission

5.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

5.2 Test configuration

EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 0.8 m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and was 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 LISN 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 for the forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. Photographs of the set up are shown in APPENDIX 3.

5.3 Test conditions

Frequency range : 0.15 MHz - 30 MHz
EUT position : Table top

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT within a Shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection has been performed. The measurements had been performed with a quasi-peak detector and if required, a CISPR average detector. The conducted emission measurements were made with the following detection of the test receiver.

Detection Type : Quasi-Peak/ CISPR Average
IF Bandwidth : 9 kHz

5.5 Results

Summary of the test results : Pass
Refer to APPENDIX 1

SECTION 6: Radiated emission (Fundamental and Spurious emission)

6.1 Operating environment

Test place : See test data (APPENDIX 1)
Temperature : See test data (APPENDIX 1)
Humidity : See test data (APPENDIX 1)

6.2 Test configuration

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

6.3 Test conditions

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

6.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane at a distance of 3 m.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area 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 3 m

Frequency: From 9 kHz to 30 MHz at distance 3 m

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.to 360 deg.) and horizontal polarization. Drawing of the antenna direction is shown in Figure 1.

Frequency: From 30 MHz to 1 GHz at distance 3 m (Refer to Figure 2).

The measuring antenna height was 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.

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

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

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

* FCC 15.31 (f)(2) (9 kHz-30 MHz)

9 kHz – 490 kHz [Limit at 3 m]= [Limit at 300 m]-40 log (3 [m]/300 [m])

490 kHz – 30 MHz [Limit at 3 m]= [Limit at 30 m]-40 log (3 [m]/30 [m])

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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. Refer to the data.

6.5 Results

Summary of the test results : Pass
No spurious emissions exceeded the fundamental emission level.

Refer to APPENDIX 1.

Figure 1. Direction of the Loop Antenna

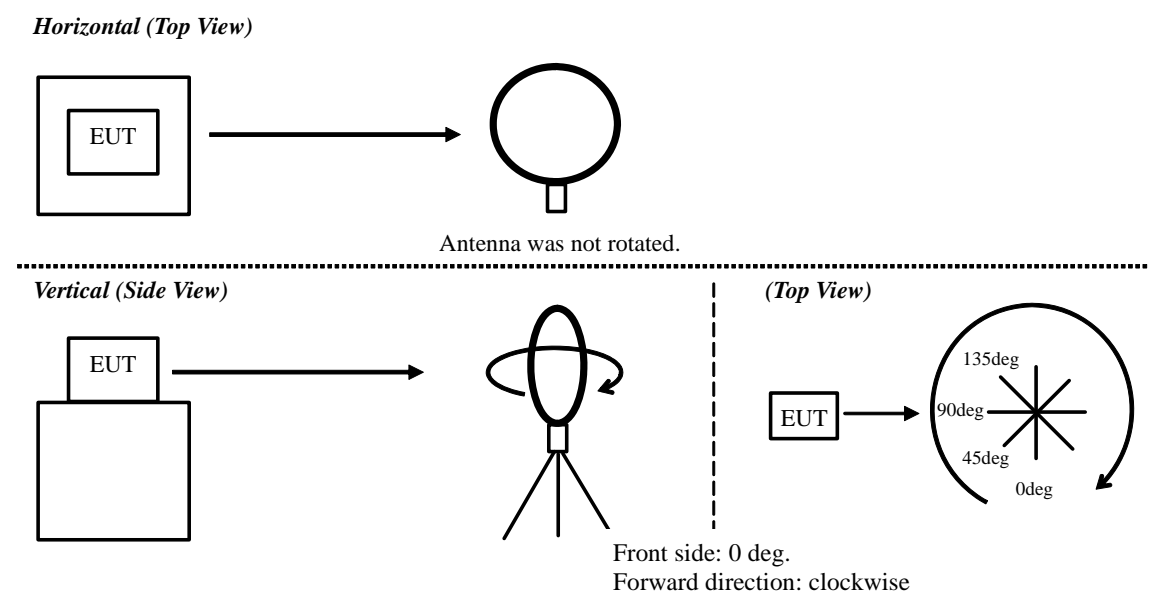
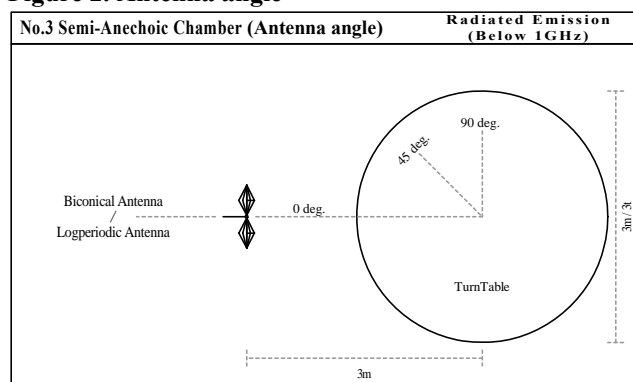


Figure 2. Antenna angle



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SECTION 7: 20 dB 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 8: 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.

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DATA OF CONDUCTED EMISSION TEST

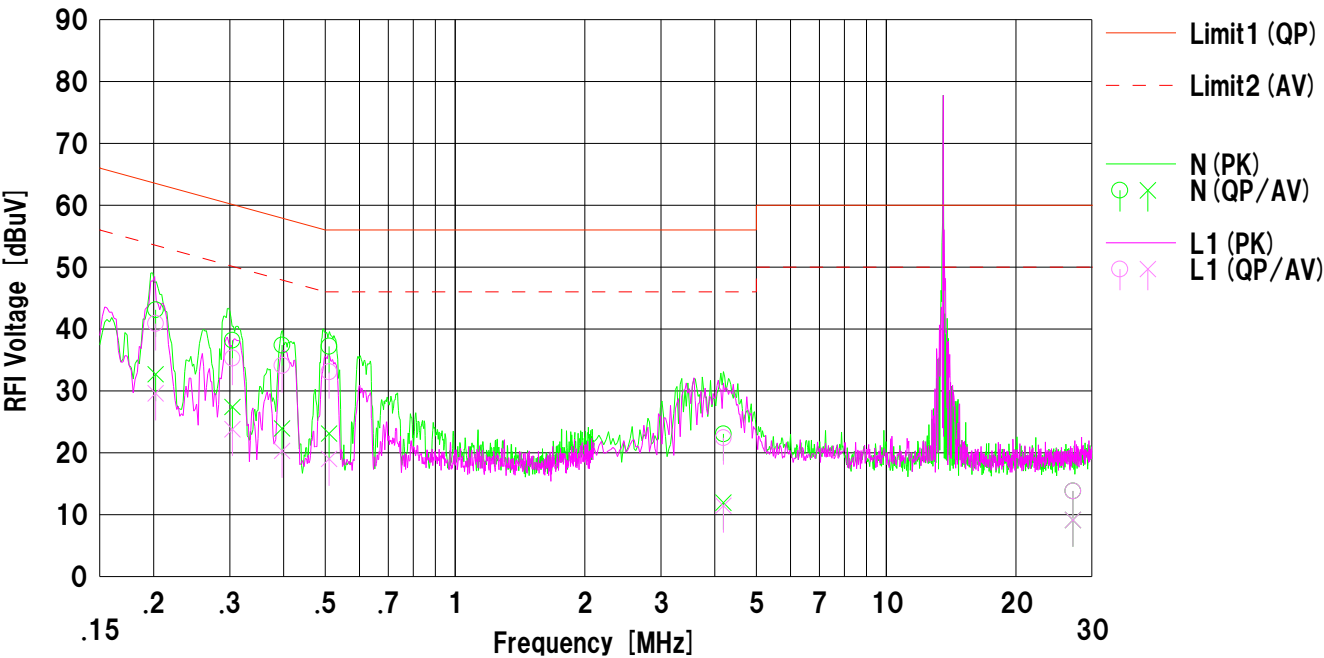
UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2016/10/07

Company : Duplo Corporation
Kind of EUT : Multi-Protocol R/W module
Model No. : PC-1080301S
Serial No. : No.2
Remarks : without Tag

Mode : Transmitting 13.56 MHz
Order No. : 11445293S
Power : DC 5 V (AC 120 V/ 60 Hz)
Temp./Humi. : 24 deg.C / 52 %RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Makoto Hosaka



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.20200	30.70	20.30	12.38	43.08	32.68	63.53	53.53	20.4	20.8	N	
2	0.30420	25.80	15.00	12.39	38.19	27.39	60.13	50.13	21.9	22.7	N	
3	0.39670	25.00	11.50	12.40	37.40	23.90	57.92	47.92	20.5	24.0	N	
4	0.51009	24.80	10.70	12.40	37.20	23.10	56.00	46.00	18.8	22.9	N	
5	4.19368	10.40	-0.70	12.62	23.02	11.92	56.00	46.00	32.9	34.0	N	
6	27.12000	0.30	-4.40	13.52	13.82	9.12	60.00	50.00	46.1	40.8	N	
7	0.20200	28.50	17.20	12.38	40.88	29.58	63.53	53.53	22.6	23.9	L1	
8	0.30420	22.90	11.40	12.39	35.29	23.79	60.13	50.13	24.8	26.3	L1	
9	0.39670	21.70	7.90	12.40	34.10	20.30	57.92	47.92	23.8	27.6	L1	
10	0.51009	20.70	6.60	12.40	33.10	19.00	56.00	46.00	22.9	27.0	L1	
11	4.19368	9.80	-1.20	12.62	22.42	11.42	56.00	46.00	33.5	34.5	L1	
12	27.12000	0.30	-4.40	13.52	13.82	9.12	60.00	50.00	46.1	40.8	L1	

DATA OF CONDUCTED EMISSION TEST

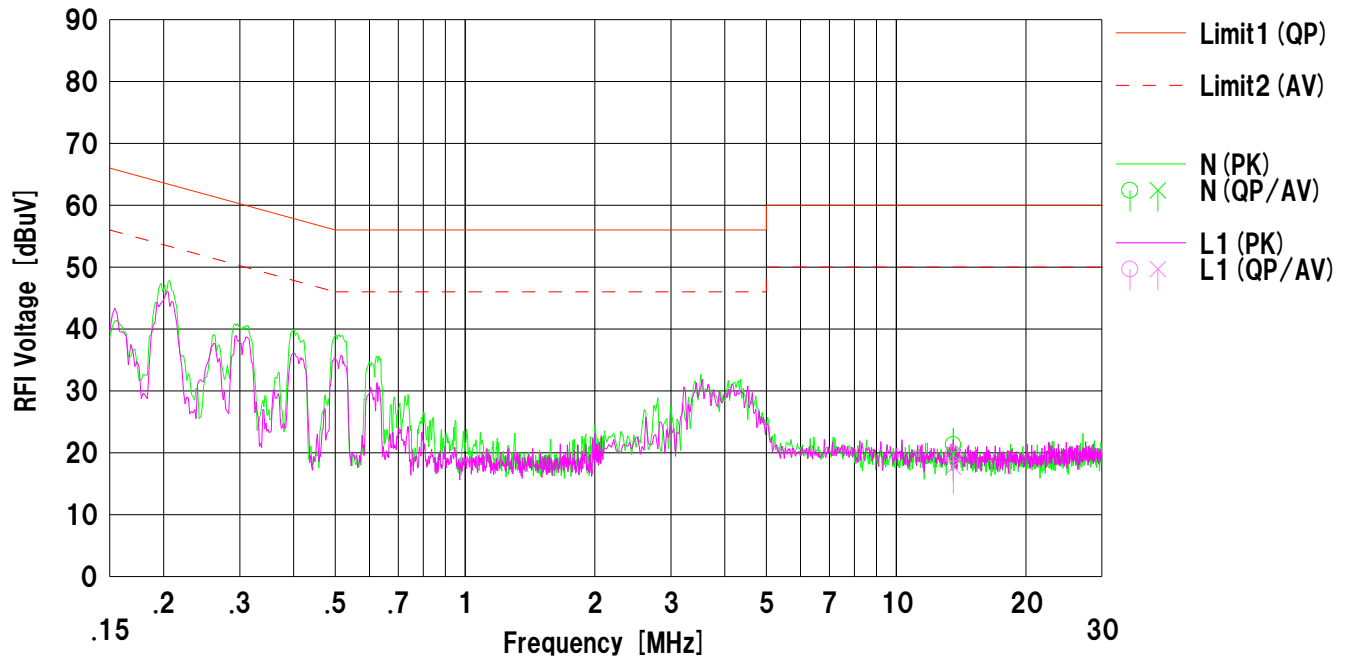
UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2016/10/08

Company : Duplo Corporation
Kind of EUT : Multi-Protocol R/W module
Model No. : PC-1080301S
Serial No. : No.5
Remarks : Antenna: Terminated
without Tag

Mode : Transmitting 13.56 MHz
Order No. : 11445293S
Power : DC 5 V (AC 120 V/ 60 Hz)
Temp./Humi. : 24 deg.C / 52 %RH

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Makoto Hosaka



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	13.56000	8.30	6.70	13.01	21.31	19.71	60.00	50.00	38.6	30.2	N	
2	13.56000	6.80	4.70	13.01	19.81	17.71	60.00	50.00	40.1	32.2	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]
LISN: SLS-05

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

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Shonan EMC Lab., No.3 Semi Anechoic Chamber

Company: Duplo Corporation
Equipment: Multi-Protocol R/W module
Model: PC-1080301S
Sample No.: No.2
Power: DC 5 V
Mode: Transmitting 13.56MHz
without tag (worst condition)
Remarks: EUT axis: H: X / V: Y, Vertical polarization (antenna angle) of the worst case: 90 deg.

Regulation: FCC Part15 Subpart C 15.225
Test Distance: 3 m
Date: October 3, 2016
Temperature: 24 deg.C
Humidity: 58 %RH
ENGINEER: Kenichi Adachi

Fundamental emission

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	Loss [dB]	AMP GAIN [dB]	Distance factor [dB]	RESULT		LIMIT (30m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]					Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.560	62.86	75.26	18.38	6.48	32.20	-40.00	15.52	27.92	83.90	68.38	55.98

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

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

Limits (30m)

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

Spurious emission within the band

No.	FREQ [MHz]	Test Receiver Reading		Antenna Factor [dB/m]	Loss [dB]	AMP GAIN [dB]	Distance factor [dB]	RESULT		LIMIT (30m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]					Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.110	29.98	30.15	18.37	6.48	32.20	-40.00	-17.37	-17.20	29.50	46.87	46.70
2	13.401	30.09	39.24	18.37	6.48	32.20	-40.00	-17.26	-8.11	40.50	57.76	48.61
3	13.410	30.09	36.16	18.37	6.48	32.20	-40.00	-17.26	-11.19	40.50	57.76	51.69
4	13.553	48.50	61.49	18.38	6.48	32.20	-40.00	1.16	14.15	50.40	49.24	36.25
5	13.567	47.12	60.15	18.38	6.48	32.20	-40.00	-0.22	12.81	50.40	50.62	37.59
6	13.710	30.32	37.67	18.38	6.49	32.20	-40.00	-17.01	-9.66	40.50	57.51	50.16
7	13.719	30.04	41.05	18.38	6.49	32.20	-40.00	-17.29	-6.28	40.50	57.79	46.78
8	14.010	30.04	30.08	18.38	6.49	32.20	-40.00	-17.29	-17.25	29.50	46.79	46.75

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)

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Radiated Emission

UL Japan, Inc.

Shonan EMC Lab. No.3 Semi Anechoic Chamber

Company: Duplo Corporation
 Equipment: Multi-Protocol R/W module
 Model: PC-1080301S
 Sample No.: No.2
 Power: DC 5 V
 Mode: Transmitting 13.56MHz
 EUT axis: Below 30MHz: EUT axis: H: X / V: Y , without tag, Vertical polarization (antenna angle) of the worst case: 90 deg.

Regulation: FCC Part15 Subpart C 15.225
 Test Distance: 3 m
 Date: October 3, 2016
 Temperature: 24 deg.C
 Humidity: 58 %RH
 ENGINEER: Kenichi Adachi

Above 30MHz: EUT axis: H: Z / V: Z, with tag

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	29.5	18.6	6.7	32.2	-40.0	-17.4	29.5	46.9	-	0	* Limit: 30m
Hori.	40.680	QP	35.2	13.6	6.8	32.2	0.0	23.4	40.0	16.6	342	73	
Hori.	67.799	QP	39.0	6.2	6.8	32.2	0.0	19.8	40.0	20.2	329	283	
Hori.	203.397	QP	40.0	16.3	8.1	32.1	0.0	32.4	43.5	11.1	158	120	
Hori.	583.073	QP	31.9	18.7	9.9	31.9	0.0	28.6	46.0	17.5	176	143	
Hori.	772.904	QP	37.5	20.8	10.6	31.7	0.0	37.2	46.0	8.8	100	278	
Hori.	854.271	QP	42.0	21.7	10.9	31.3	0.0	43.2	46.0	2.8	100	306	
Vert.	27.12	QP	29.5	18.6	6.7	32.2	-40.0	-17.3	29.5	46.8	-	0	* Limit: 30m
Vert.	40.680	QP	49.1	13.6	6.8	32.2	0.0	37.3	40.0	2.7	100	187	
Vert.	67.799	QP	54.9	6.2	6.8	32.2	0.0	35.7	40.0	4.3	100	183	
Vert.	122.038	QP	47.1	12.7	7.4	32.1	0.0	35.1	40.0	4.9	100	28	
Vert.	528.833	QP	45.0	17.8	9.7	32.0	0.0	40.6	43.5	2.9	100	66	
Vert.	555.953	QP	47.7	18.3	9.8	32.0	0.0	43.8	46.0	2.2	100	293	
Vert.	583.073	QP	47.2	18.7	9.9	31.9	0.0	43.9	46.0	2.1	100	295	

Result = Reading + Ant Factor + Loss (Cable+ATT+ΔAF(above 30MHz)) - Gain(Amplifier) + 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= 55.5dBuV/m, Ver= 67.9 dBuV/m

UL Japan, Inc.

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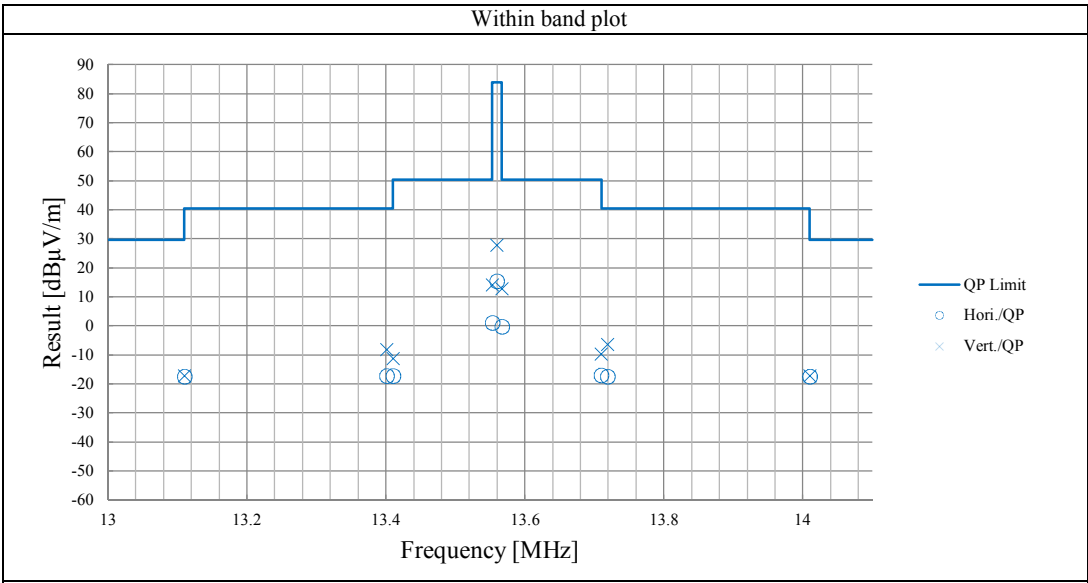
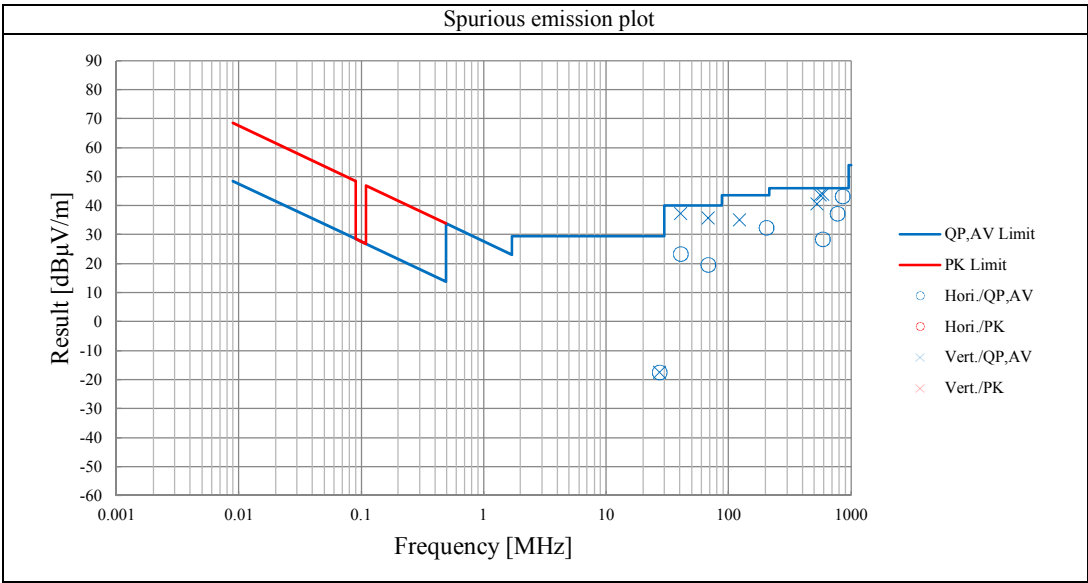
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Radiated Emission (Worst mode plot)

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

Company:	Duplo Corporation	Regulation:	FCC Part15 Subpart C 15.225
Equipment:	Multi-Protocol R/W module	Test Distance:	3 m
Model:	PC-1080301S	Date:	October 3, 2016
Sample No.:	No.2	Temperature:	24 deg.C
Power:	DC 5 V	Humidity:	58 %RH
Mode:	Transmitting 13.56MHz	ENGINEER:	Kenichi Adach:
EUT axis:	Below 30MHz: EUT axis: H: X / V: Y , without tag, Vertical polarization (antenna angle) of the worst case: 90 deg. Above 30MHz: EUT axis: H: Z / V: Z, with tag		
Remarks:	These plots data contains sufficient number to show the trend of characteristic features for EUT.		



Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded room

Company Duplo Corporation
 Equipment Multi-Protocol R/W module
 Model PC-1080301S
 Serial No. No.3
 Power DC 5V
 Mode Transmitting 13.56 MHz

Regulation FCC Part15 Subpart C 15.225 (e)
 Date October 17, 2016
 Temperature 27 deg.C
 Humidity 33 %RH
 ENGINEER Shinichi Takano

Temperature Variation: -20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559875	-0.000125	-0.00092	0.010
after 2minutes	13.56	13.559919	-0.000081	-0.00060	0.010
after 5minutes	13.56	13.559922	-0.000078	-0.00058	0.010
after 10minutes	13.56	13.559922	-0.000078	-0.00058	0.010

Temperature Variation: -10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559915	-0.000085	-0.00063	0.010
after 2minutes	13.56	13.559927	-0.000073	-0.00054	0.010
after 5minutes	13.56	13.559926	-0.000074	-0.00055	0.010
after 10minutes	13.56	13.559926	-0.000074	-0.00055	0.010

Temperature Variation: 0deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559928	-0.000072	-0.00053	0.010
after 2minutes	13.56	13.559913	-0.000087	-0.00064	0.010
after 5minutes	13.56	13.559912	-0.000088	-0.00065	0.010
after 10minutes	13.56	13.559912	-0.000088	-0.00065	0.010

Temperature Variation: 10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559915	-0.000085	-0.00063	0.010
after 2minutes	13.56	13.559893	-0.000107	-0.00079	0.010
after 5minutes	13.56	13.559887	-0.000113	-0.00083	0.010
after 10minutes	13.56	13.559886	-0.000114	-0.00084	0.010

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559896	-0.000104	-0.00077	0.010
after 2minutes	13.56	13.559865	-0.000135	-0.00100	0.010
after 5minutes	13.56	13.559859	-0.000141	-0.00104	0.010
after 10minutes	13.56	13.559858	-0.000142	-0.00105	0.010

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Data of Frequency Tolerance

Temperature Variation: 30deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559868	-0.000132	-0.00097	0.010
after 2minutes	13.56	13.559840	-0.000160	-0.00118	0.010
after 5minutes	13.56	13.559835	-0.000165	-0.00122	0.010
after 10minutes	13.56	13.559836	-0.000164	-0.00121	0.010

Temperature Variation: 40deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559843	-0.000157	-0.00116	0.010
after 2minutes	13.56	13.559827	-0.000173	-0.00128	0.010
after 5minutes	13.56	13.559826	-0.000174	-0.00128	0.010
after 10minutes	13.56	13.559826	-0.000174	-0.00128	0.010

Temperature Variation: 50deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559828	-0.000172	-0.00127	0.010
after 2minutes	13.56	13.559833	-0.000167	-0.00123	0.010
after 5minutes	13.56	13.559838	-0.000162	-0.00119	0.010
after 10minutes	13.56	13.559839	-0.000161	-0.00119	0.010

Data of Frequency Tolerance

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded room

Company Duplo Corporation
 Equipment Multi-Protocol R/W module
 Model PC-1080301S
 Serial No. No.3
 Power DC 5V
 Mode Transmitting 13.56 MHz

Regulation FCC Part15 Subpart C 15.225 (e)
 Date October 17, 2016
 Temperature 27 deg.C
 Humidity 33 %RH
 ENGINEER Shinichi Takano

Voltage Variation: DC 4.25 V**Temperature Variation: 20deg.C**

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559891	-0.000109	-0.00080	0.010
after 2minutes	13.56	13.559871	-0.000129	-0.00095	0.010
after 5minutes	13.56	13.559867	-0.000133	-0.00098	0.010
after 10minutes	13.56	13.559867	-0.000133	-0.00098	0.010

Voltage Variation: DC 5.75 V**Temperature Variation: 20deg.C**

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559891	-0.000109	-0.00080	0.010
after 2minutes	13.56	13.559859	-0.000141	-0.00104	0.010
after 5minutes	13.56	13.559852	-0.000148	-0.00109	0.010
after 10minutes	13.56	13.559852	-0.000148	-0.00109	0.010

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

UL Japan, Inc.

Shonan EMC Lab. No.5 Shielded Room

Company: Duplo Corporation
 Equipment: Multi-Protocol R/W module
 Model: PC-1080301S
 Sample No.: No.3
 Power: DC 5 V
 Mode: Transmitting 13.56MHz
 Worst : Without Tag

Regulation: FCC Part15 Subpart C 15.215

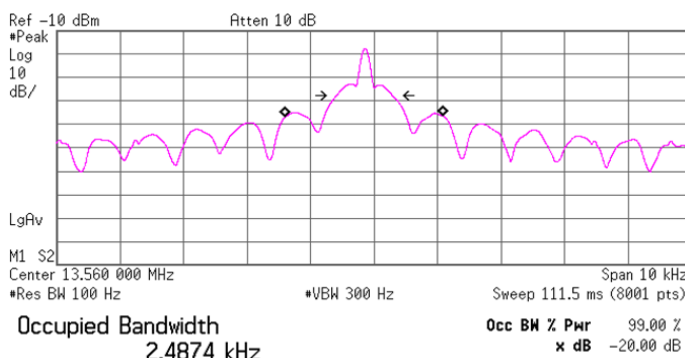
Date: October 17, 2016

Temperature: 27 deg.C

Humidity: 33 %RH

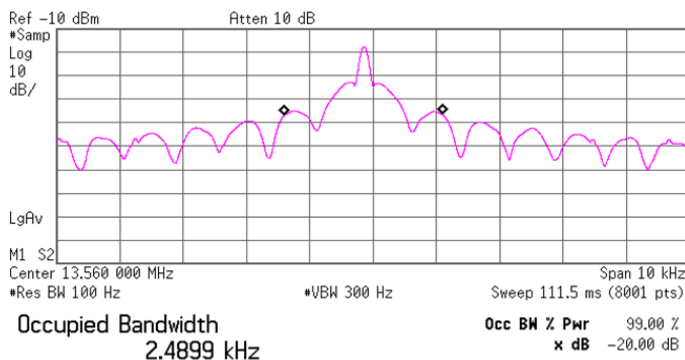
ENGINEER: Shinichi Takano

20dB Bandwidth: 0.871 kHz
 * Agilent R T



Transmit Freq Error -157.523 Hz
 x dB Bandwidth 870.929 Hz

99% Occupied Bandwidth: 2.490 kHz
 * Agilent R T



Transmit Freq Error -151.752 Hz
 x dB Bandwidth 878.276 Hz*

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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)
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2016/07/15 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2015/10/11 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2015/10/11 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2016/08/04 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/ Suhner/Suhner/Suhner/ TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-271(RF Selector)	RE	2016/04/22 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2016/02/25 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE/CE	2016/03/28 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFLMF)	-	RE/CE	-
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2016/10/12 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE/CE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	RE/CE	2015/11/18 * 12
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2015/11/14 * 12
SCC-C9/C10/SRSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/N S4906	-/0901-271(RF Selector)	CE	2016/04/22 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2016/02/09 * 12
SAT3-07	Attenuator	JFW	50HF-003N	-	CE	2016/09/23 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2015/12/07 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	TF	2015/12/07 * 12
SCH-01	Temperature and Humidity Chamber	Espec	PL-1KT	14020837	TF	2016/04/14 * 12
SSCA-01	Search coil	LANGER	RF-R 400-1	02-0634	TF	Pre Check
STS-06	Digital Hitester	Hioki	3805-50	080997830	TF	2016/03/22 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	TF	2016/09/26 * 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 :

CE: Conducted emission,

RE: Radiated emission,

TF: Test Fixture