

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded room
Date : 2010/01/12

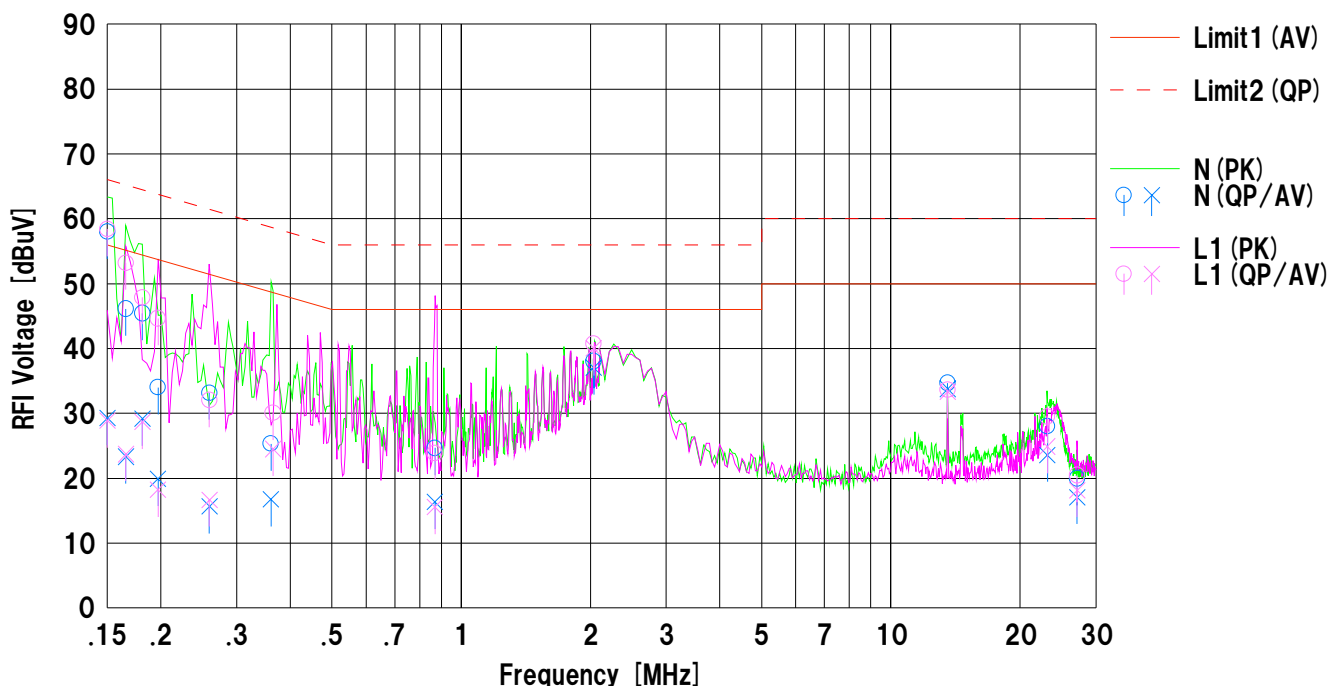
Company : RICOH COMPANY LTD.
Kind of EUT : RFID module
Model No. : RFID:RW:ZU-P1
Serial No. : Refer to Section4.2

Mode : Transmitting (13.56MHz)
Report No. : 30IE0121-SH-01
Power : AC120V/60Hz
Temp./Humi. : 18°C / 25%

Remarks : Module Ch0:Black

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

Engineer : Hikaru Shirasawa



No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dB]	<QP> [dB]		
1	0.15000	47.0	18.3	11.0	58.0	29.3	56.0	66.0	26.7	8.0	N	
2	0.16563	35.4	12.6	10.7	46.1	23.3	55.2	65.2	31.9	19.1	N	
3	0.18126	35.1	18.8	10.4	45.5	29.2	54.4	64.4	25.2	19.0	N	
4	0.19689	23.9	9.8	10.1	34.0	19.9	53.7	63.7	33.8	29.7	N	
5	0.25942	23.2	5.6	10.0	33.2	15.6	51.4	61.4	35.8	28.2	N	
6	0.36102	15.4	6.9	9.9	25.3	16.8	48.7	58.7	31.9	33.4	N	
7	0.86904	14.9	6.6	9.8	24.7	16.4	46.0	56.0	29.6	31.3	N	
8	2.03677	28.2	27.3	9.8	38.0	37.1	46.0	56.0	8.9	18.0	N	
9	13.56000	24.2	23.3	10.5	34.7	33.8	50.0	60.0	16.2	25.3	N	
10	23.12802	16.9	12.5	11.1	28.0	23.6	50.0	60.0	26.4	32.0	N	
11	27.12000	8.6	5.7	11.4	20.0	17.1	50.0	60.0	32.9	40.0	N	
12	0.15000	47.4	17.9	11.0	58.4	28.9	56.0	66.0	27.1	7.6	L1	
13	0.16563	42.5	13.0	10.7	53.2	23.7	55.2	65.2	31.5	12.0	L1	
14	0.18126	37.5	18.3	10.4	47.9	28.7	54.4	64.4	25.7	16.6	L1	
15	0.19689	34.5	8.1	10.1	44.6	18.2	53.7	63.7	35.5	19.1	L1	
16	0.25942	22.0	6.7	10.0	32.0	16.7	51.4	61.4	34.7	29.4	L1	
17	0.36498	20.2	14.6	9.9	30.1	24.5	48.6	58.6	24.1	28.5	L1	
18	0.86904	14.1	5.8	9.8	23.9	15.6	46.0	56.0	30.4	32.1	L1	
19	2.03677	30.9	30.2	9.8	40.7	40.0	46.0	56.0	6.0	15.3	L1	
20	13.56000	23.2	22.9	10.5	33.7	33.4	50.0	60.0	16.7	26.3	L1	
21	23.12802	18.4	13.8	11.1	29.5	24.9	50.0	60.0	25.1	30.5	L1	
22	27.12000	9.1	6.8	11.4	20.5	18.2	50.0	60.0	31.9	39.5	L1	

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

Data of Field Strength and Outside Filed Strength: FCC15.225(a)(b)(c)

UL Japan, Inc.
Shonan No3 Semi-Anechoic Chamber

Company : RICOH COMPANY LTD.	Report No. : 30IE0212-SH
Equipment : RFID module	Regulation : FCC Part15 SupartC 15.225
Model : RFID:RW:ZU-P1	Test Distance : 3m
Sample No. : Refer to Section 4.2	Date : 2010/1/12
Power : AC120V/50Hz	Temperature : 18deg.C
Mode : Transmitting (13.56MHz)	Humidity : 25%
Remarks : Vertical polarization (antenna angle) of the worst case: 0deg	

ENGINEER : Hikaru Shirasawa

Field strength

No.	FREQ [MHz]	T/R Reading		ANT Factor [dB/m]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT		LIMIT (3m) [dBuV/m]	MARGIN	
		Hor [dBuV]	Ver [dBuV]				Hor [dBuV/m]	Ver [dBuV/m]		Hor [dB]	Ver [dB]
1	13.560	38.8	49.4	19.7	6.3	32.1	32.7	43.3	124.0	91.3	80.7

Field strength of 13.553MHz to 13.567MHz Limit(3m) = 84dBuV/m + 40log 30m/3m
= 124dBuV/m (FCC15.225(a))

Outside Field strength

No.	FREQ [MHz]	T/R Reading		ANT Factor [dB/m]	CABLE LOSS [dB]	AMP GAIN [dB]	RESULT		LIMIT (3m) [dBuV/m]	MARGIN	
		Ver [dBuV]					Ver [dBuV/m]			Ver [dB]	
1	13.110	30.7	30.8	19.7	6.3	32.1	24.6	24.7	69.5	44.9	44.8
2	13.410	30.6	30.7	19.7	6.3	32.1	24.5	24.6	80.5	56.0	55.9
3	13.553	34.2	38.3	19.7	6.3	32.1	28.1	32.2	90.5	62.4	58.3
4	13.567	33.1	37.2	19.7	6.3	32.1	27.0	31.1	90.5	63.5	59.4
5	13.710	30.4	30.6	19.6	6.3	32.1	24.2	24.4	80.5	56.3	56.1
6	14.010	30.2	30.4	19.6	6.3	32.1	24.0	24.2	69.5	45.5	45.3

Outside filed strength frequencies

- filed strength band $F_c \pm 7\text{kHz}$: 13.553MHz to 13.567MHz
 - Outside filde strength $F_c \pm 150\text{kHz}$: 13.410MHz to 13.710MHz
 - Outside filde strength $F_c \pm 450\text{kHz}$: 13.110MHz to 14.010MHz
- $F_c = 13.56\text{MHz}$

Limits (3m)

- 13.410MHz to 13.553MHz and 13.567MHz to 13.710MHz : $50.5\text{dBuV/m} + 40\log 30\text{m}/3\text{m} = 90.5\text{dBuV/m}$ (FCC15.225(b))
- 13.110MHz to 14.010MHz and 13.710MHz to 14.010MHz : $40.5\text{dBuV/m} + 40\log 30\text{m}/3\text{m} = 80.5\text{dBuV/m}$ (15.225(c))
- Below 13.110MHz and Above 14.010MHz : $29.5\text{dBuV/m} + 40\log 30\text{m}/3\text{m} = 69.5\text{dBuV/m}$ (FCC15.225(d)and FCC15.209)

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2010/01/12

Company : RICOH COMPANY LTD.
Kind of EUT : RFID module
Model No. : RFID:RW:ZU-P1
Serial No. : Refer to Section4.2

Mode : Transmitting (13.56MHz)
Report No. : 30IE0121-SH-01
Power : AC120V/60Hz
Temp./Humi. : 18°C / 25%

Remarks : Module Ch0:Black, 0deg:Vertical, 90deg:Horizontal

Tested by : Hikaru Shirasawa

<< QP DATA >>

No.	Freq. [MHz]	Reading	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit	Margin	Antenna	Table	Comment
		<QP> [dBuV]				<QP> [dBuV/m]	<QP> [dB]	<QP> [deg]			
1	27.12000	36.2	21.1	6.5	32.1	31.7	---	---	0deg	95	
2	27.12000	31.0	21.1	6.5	32.1	26.5	---	---	90deg	160	

Calculation:Result [dBuV/m] =Reading [dBuV] +Ant.Fac [dB/m] +Loss (Cable+ATT) [dB] +Gain (AMP) [dB]
Ant.Type=LOOP:Loop Antenna

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2010/01/12

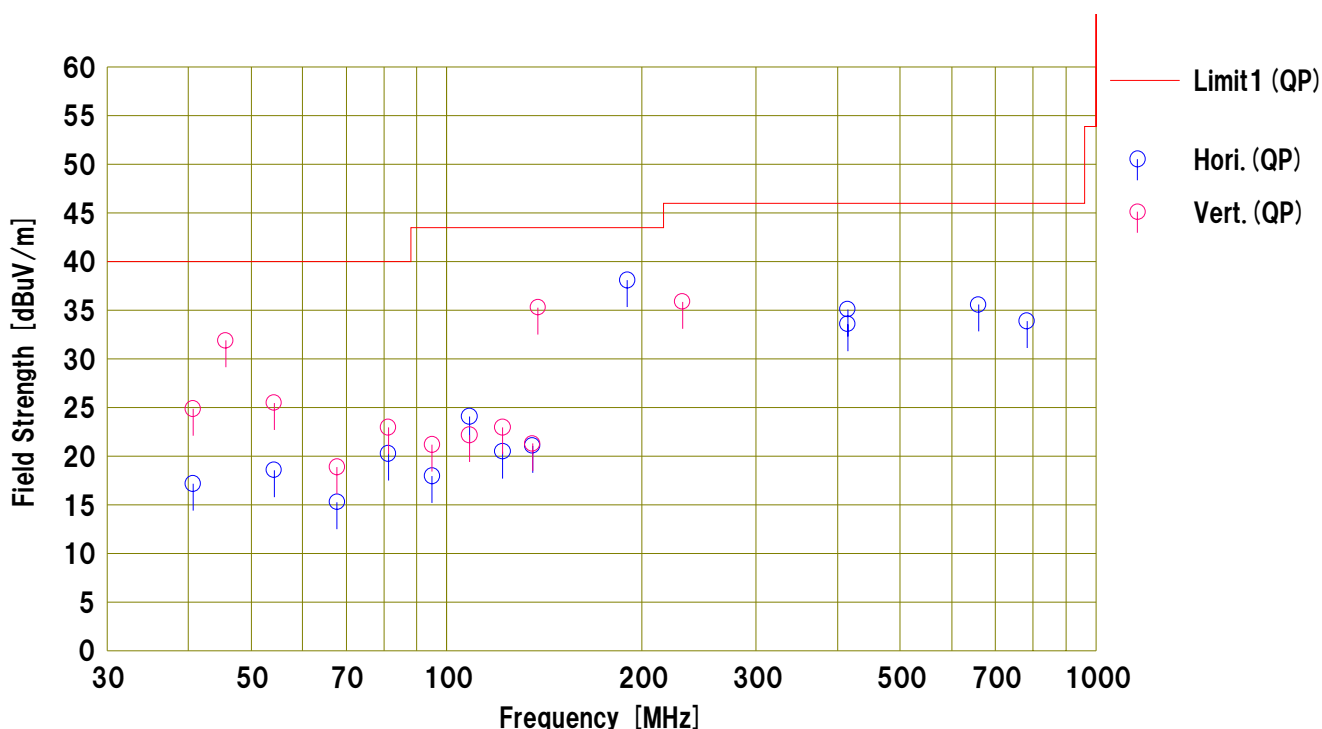
Company : RICOH COMPANY LTD.
Kind of EUT : RFID module
Model No. : RFID:RW:ZU-P1
Serial No. : Refer to Section4.2

Mode : Transmitting (13.56MHz)
Report No. : 30IE0121-SH-01
Power : AC120V/60Hz
Temp./Humi. : 18°C / 25%

Remarks : Module Ch0:Black

Limit1 : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK

Engineer : Hikaru Shirasawa



No.	Freq. [MHz]	Reading	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit	Margin	Pola.	Height [cm]	Angle [deg]	Ant. Type	Comment
		<QP> [dBuV]				<QP> [dBuV/m]	<QP> [dB]	[H/V]					
1	40.680	27.8	14.9	6.6	32.1	17.2	40.0	22.8	Hori	295	103	BC	
2	54.240	33.6	10.3	6.8	32.1	18.6	40.0	21.4	Hori	400	116	BC	
3	67.800	33.4	7.1	6.9	32.1	15.3	40.0	24.7	Hori	266	98	BC	
4	81.360	38.8	6.6	7.0	32.1	20.3	40.0	19.7	Hori	400	299	BC	
5	94.920	33.8	9.2	7.1	32.1	18.0	43.5	25.5	Hori	191	94	BC	
6	108.480	37.5	11.5	7.2	32.1	24.1	43.5	19.4	Hori	165	106	BC	
7	122.040	32.0	13.2	7.3	32.0	20.5	43.5	23.0	Hori	265	102	BC	
8	135.600	31.6	14.1	7.4	32.0	21.1	43.5	22.4	Hori	120	59	BC	
9	189.827	46.1	16.3	7.7	32.0	38.1	43.5	5.4	Hori	100	90	BC	
10	414.714	42.1	16.2	8.7	31.9	35.1	46.0	10.9	Hori	100	277	LP	
11	414.717	42.9	14.2	8.4	31.9	33.6	46.0	12.4	Hori	100	256	LP	
12	660.056	38.2	19.7	9.6	31.9	35.6	46.0	10.4	Hori	100	211	LP	
13	783.377	35.0	20.7	10.0	31.8	33.9	46.0	12.1	Hori	124	230	LP	
14	40.680	35.5	14.9	6.6	32.1	24.9	40.0	15.1	Vert.	100	164	BC	
15	45.691	44.2	13.1	6.7	32.1	31.9	40.0	8.1	Vert.	100	336	BC	
16	54.240	40.5	10.3	6.8	32.1	25.5	40.0	14.5	Vert.	100	188	BC	
17	67.800	37.0	7.1	6.9	32.1	18.9	40.0	21.1	Vert.	100	53	BC	
18	81.360	41.5	6.6	7.0	32.1	23.0	40.0	17.0	Vert.	113	58	BC	
19	94.920	37.0	9.2	7.1	32.1	21.2	43.5	22.3	Vert.	100	80	BC	
20	108.480	35.6	11.5	7.2	32.1	22.2	43.5	21.3	Vert.	100	194	BC	
21	122.040	34.5	13.2	7.3	32.0	23.0	43.5	20.5	Vert.	100	307	BC	
22	135.600	31.8	14.1	7.4	32.0	21.3	43.5	22.2	Vert.	100	286	BC	
23	138.216	45.7	14.2	7.4	32.0	35.3	43.5	8.2	Vert.	100	267	BC	
24	230.742	43.0	17.0	7.9	32.0	35.9	46.0	10.1	Vert.	100	348	BC	

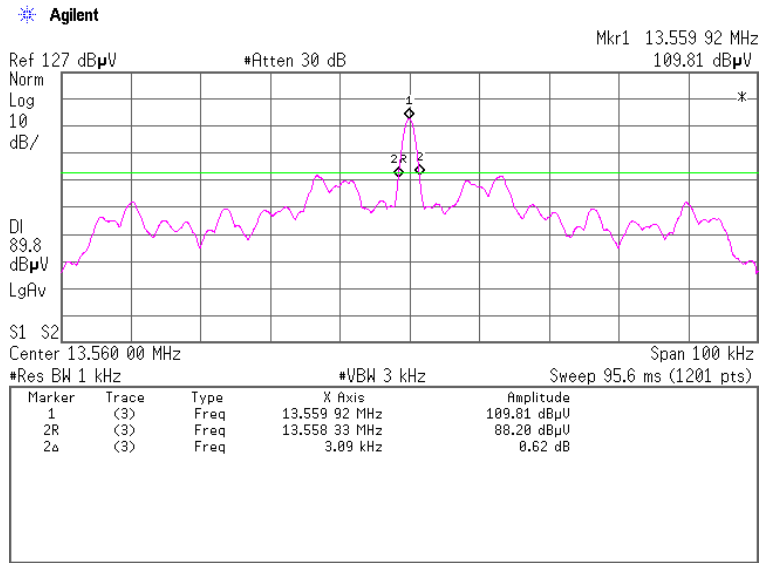
Calculation:Result [dBuV/m] =Reading [dBuV] +Ant.Fac [dB/m] +Loss (Cable+ATT) [dB] -Gain (AMP) [dB]
Ant.Type=BC:Biconical Antenna, LP:Logperiodic Antenna, SHA**:Horn Antenna

20dB bandwidth & Occupied bandwidth (99%): FCC 15.215(c)

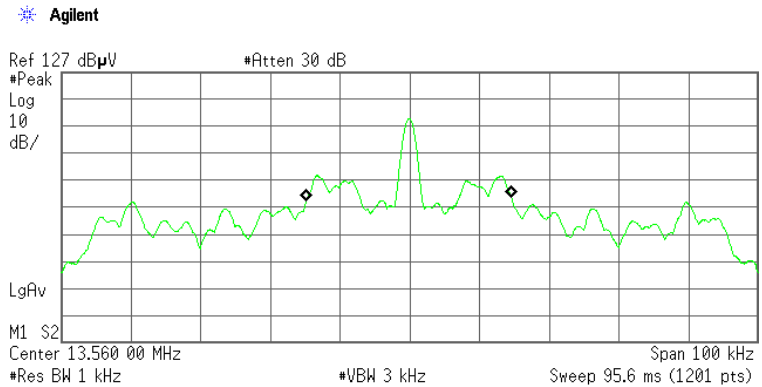
COMPANY : RiCOH COMPANY LTD.
Equipment : RFID module
MODEL NUMBER: RFID:RW:ZU-P1
SERIAL NUMBER: Refer to section 4.2
POWER : DC5V

UL Japan, Inc. Shonan No5 Shield room
REPORT No. : 30IE0121-SH-01
REGULATION : FCC Part15SubpartC 215(c)
DATE : 2010/01/19
TEMP./HUMI : 25°C/28%
TEST MODE : Transmitting(13.56MHz)
ENGINEER : Hikaru Shirasawa

20dB Bandwidth: 3.09kHz



OBW(99%): 29.5024kHz



Occupied Bandwidth
29.5024 kHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -147.425 Hz
x dB Bandwidth 28.246 kHz

Data of Frequency Tolerance: FCC 15.225(e)

UL Japan, Inc.
Shonan No5 Shield room

Company : RICOH COMPANY LTD.
Equipment : RFID module
Model : RFID:RW:ZU-P1
Sample No. : Refer to Section4.2
Power : DC5V
Mode : Transmitting (13.56MHz)

Report No. : 30IE0121-SH-01
Regulation : FCC Part15 SupartC 15.225 (e)

Date : 2010/01/19
Temperature : 25deg.C
Humidity : 28%

ENGINEER : Hikaru Shirasawa

Temperature Variation: -30deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559795	-0.0002050	-0.00151	0.01
after 2minutes	13.56	13.559796	-0.0002040	-0.00150	0.01
after 5minutes	13.56	13.559794	-0.0002060	-0.00152	0.01
after 10minutes	13.56	13.559801	-0.0001990	-0.00147	0.01

Temperature Variation: -20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559942	-0.0000580	-0.00043	0.01
after 2minutes	13.56	13.559942	-0.0000580	-0.00043	0.01
after 5minutes	13.56	13.559942	-0.0000580	-0.00043	0.01
after 10minutes	13.56	13.559943	-0.0000570	-0.00042	0.01

Temperature Variation: -10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560019	0.0000190	0.00014	0.01
after 2minutes	13.56	13.560020	0.0000200	0.00015	0.01
after 5minutes	13.56	13.560020	0.0000200	0.00015	0.01
after 10minutes	13.56	13.560019	0.0000190	0.00014	0.01

Temperature Variation: 0deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560047	0.0000470	0.00035	0.01
after 2minutes	13.56	13.560046	0.0000460	0.00034	0.01
after 5minutes	13.56	13.560046	0.0000460	0.00034	0.01
after 10minutes	13.56	13.560045	0.0000450	0.00033	0.01

Temperature Variation: 10deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560040	0.0000400	0.00029	0.01
after 2minutes	13.56	13.560040	0.0000400	0.00029	0.01
after 5minutes	13.56	13.560039	0.0000390	0.00029	0.01
after 10minutes	13.56	13.560039	0.0000390	0.00029	0.01

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560019	0.0000190	0.00014	0.01
after 2minutes	13.56	13.560018	0.0000180	0.00013	0.01
after 5minutes	13.56	13.560017	0.0000170	0.00013	0.01
after 10minutes	13.56	13.560017	0.0000170	0.00013	0.01

Temperature Variation: 30deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559989	-0.0000110	-0.00008	0.01
after 2minutes	13.56	13.559988	-0.0000120	-0.00009	0.01
after 5minutes	13.56	13.559987	-0.0000130	-0.00010	0.01
after 10minutes	13.56	13.559986	-0.0000140	-0.00010	0.01

Temperature Variation: 40deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559953	-0.0000470	-0.00035	0.01
after 2minutes	13.56	13.559952	-0.0000480	-0.00035	0.01
after 5minutes	13.56	13.559952	-0.0000480	-0.00035	0.01
after 10minutes	13.56	13.559951	-0.0000490	-0.00036	0.01

Temperature Variation: 50deg.C

Test Conditions	Original Frequency (MHz)	Mesure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.559926	-0.0000740	-0.00055	0.01
after 2minutes	13.56	13.559925	-0.0000750	-0.00055	0.01
after 5minutes	13.56	13.559925	-0.0000750	-0.00055	0.01
after 10minutes	13.56	13.559924	-0.0000760	-0.00056	0.01

Data of Frequency Tolerance: FCC 15.225(e)

UL Japan, Inc.
Shonan No5 Shield room

Company : RICOH COMPANY LTD.
Equipment : RFID module
Model : RFID:RW:ZU-P1
Sample No. : Refer to Section4.2
Power : DC5V
Mode : Transmitting (13.56MHz)

Report No. : 30IE0121-SH-01
Regulation : FCC Part15 SupartC 15.225 (e)

Date : 2010/01/19
Temperature : 25deg.C
Humidity : 28%

ENGINEER : Hikaru Shirasawa

Input Voltage:DC4.25V (85%)

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560016	0.0000160	0.00012	0.01
after 2minutes	13.56	13.560016	0.0000160	0.00012	0.01
after 5minutes	13.56	13.560016	0.0000160	0.00012	0.01
after 10minutes	13.56	13.560016	0.0000160	0.00012	0.01

Input Voltage:DC5.75V (115%)

Temperature Variation: 20deg.C

Test Conditions	Original Frequency (MHz)	Measure Frequency (MHz)	Frequency Error (MHz)	Frequency tolerance (%)	Limit (%)
startup	13.56	13.560016	0.0000160	0.00012	0.01
after 2minutes	13.56	13.560016	0.0000160	0.00012	0.01
after 5minutes	13.56	13.560015	0.0000150	0.00011	0.01
after 10minutes	13.56	13.560015	0.0000150	0.00011	0.01

APPENDIX 3 Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2009/02/13 * 12
SAT6-05	Attenuator	JFW	50HF-006N	-	RE	2009/02/13 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2009/03/20 * 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	2009/04/06 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A0901	RE	2009/03/20 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2009/02/04 * 12
STR-03	Test Receiver	Rohde & Schwarz	ESI40	100054/040	RE	2009/04/08 * 12
SJM-03	Measure	KOMELON	KMC-36	-	RE	-
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2009/09/18 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV	-	RE	-
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	ME	2009/10/06 * 12
SLS-07	LISN	Schwarzbeck	NSLK8126	8126441	CE(EUT)	2009/04/02 * 12
SLS-04	LISN	Rohde & Schwarz	ENV216	100514	CE(AE)	2009/02/25 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2009/02/04 * 12
STM-05	Terminator	TME	CT-01 BP	-	CE	2010/01/08 * 12
SCC-C9/C10/SRSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-271(RF Selector)	CE	2009/04/06 * 12
SFC-01	Microwave Counter	Agilent	53151A	US40511493	FT	2009/02/10 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	BW	2009/06/09 * 12
SCH-01	Temperature and Humidity Chamber	Espec	PL-1KT	14020837	FT	2009/04/14 * 12
SSCA-01	Search coil	LANGER	RF-R 400-1	02-0634	BW/FT	Pre Check

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 traceable calibrations . Each calibration is traceable to the national or international standards .

Test Item :

CE: Conducted emission,
RE: Radiated emission,
BW: Bandwidth,
FT: Frequency Tolerance