

## EMI TEST REPORT

**Test Report No. : 25IE0303-HO-2a**

**Applicant** : **KEYENCE CORPORATION**  
**Type of Equipment** : **Radio Frequency Identification System**  
**Model No.** : **RF-550**  
**Test standard** : **FCC Part 15 Subpart C : 2005  
Section 15.207 and 15.225**  
**FCC ID** : **RF40773A**  
**Test Result** : **Complied**

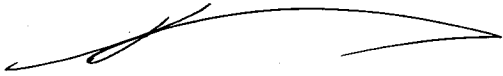
1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.

**Date of test:** August 25 to September 1, 2005

**Tested by :**

  
Hiroka Umeyama  
EMC Services

**Approved by :**

  
Naoki Sakamoto  
Group Leader of  
EMC Services

**UL Apex Co., Ltd.**

**Head Office EMC Lab.**

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## **SECTION 1: Client information**

Company Name : KEYENCE CORPORATION  
Brand or Trade name : KEYENCE  
Address : 1-3-14, Higashinakajima, Higashiyodogawa-ku, Osaka, 533-8555, JAPAN  
Telephone Number : +81-6-6379-1111  
Facsimile Number : +81-6-6379-1182  
Contact Person : Hiroaki Yamamoto

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

### **2.1 Identification of E.U.T.**

Type of Equipment : Radio Frequency Identification System  
Model No. : RF-550  
Serial No. : M001, M002, M003  
Rating : DC 5.0V  
Country of Manufacture : Japan  
Receipt Date of Sample : August 25, 2005  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)

### **2.2 Product Description**

Model No.: RF-550 is Radio Frequency Identification device (RFID) for industrial use.  
Basically, EUT is installed in the production line, such as conveyor, to get production information from a workpiece.

Equipment Type : Transceiver  
Frequency Bands : 13.11-14.01MHz  
Frequency of Operation : 13.56 MHz  
Type of modulation : ASK  
Mode of operation : Simplex  
Antenna Type : Loop Antenna  
Operating voltage (inner) : DC 5.0V  
Operating Temperature : RFID Compact Read/Write Head: 0 to +60 deg. C.  
RFID Standard Tag: -20 to +85deg. C.

### **FCC 15.31 (e)**

The stable voltage (DC5.0V) regulated by DC-DC Converter (5.0V-5.0V) is constantly supplied to RF Module.  
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 EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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## SECTION 3: Test specification, procedures & results

### 3.1 Test Specification

Test Specification : FCC Part15 Subpart C : 2005  
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

### 3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	Section 15.207	-	N/A	5.4dB, AV, N 0.20304MHz	Complied
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.225(a)	Radiated	N/A	42.2dB	Complied
3	Spectrum Mask	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.225(b)(c)	Radiated	N/A	20.2dB 13.553MHz	Complied
4	-20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.215(c)	Radiated	N/A	N/A	N/A
5	Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.209, Section 15.225 (d)	Radiated	N/A	1.0dB 176.092MHz Vertical	Complied
6	Frequency Tolerance	ANSI C63.4:2003 13. Measurement of intentional radiators	Section15.225(e)	Radiated	N/A	*See data.	Complied

Note: UL Apex's EMI Work Procedures No.QPM05.

#### Uncertainty:

\*In case of the margin below the EMC Head Office's uncertainty.

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

#### Conducted Emission

The measurement uncertainty (with a 95% confidence level) for this test is  $\pm 1.3$ dB.

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

#### Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test using Loop antenna is  $\pm 1.9$ dB(3m)/  $\pm 1.8$ dB(10m).

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is  $\pm 4.5$ dB(3m)/  $\pm 4.7$ dB(10m).

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is  $\pm 5.2$ dB(3m)/  $\pm 3.8$ dB(10m).

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is  $\pm 6.6$ dB.

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

#### Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test is  $\pm 3.0$ dB.

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

\*These tests were performed without any deviations from test procedure except for additions or exclusions.

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### 3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004 + Amendment4: 2004	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004 + Amendment4: 2004	Conducted	N/A	N/A	N/A

### 3.4 Confirmation

UL Apex Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart C: 2005 Section 15.207 and 15.225.

### 3.5 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. \*NVLAP Lab. code: 200572-0  
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	Listed date (for FCC)	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	February 01, 2002	313583	IC4247A	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	June 05, 2002	846015	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 shielded room	-	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.4 measurement room	-	-	-	3.1 x 5.0 x 2.7m	N/A	-

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

### 3.6 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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

### **4.1 Operating Modes**

The EUT was operated in a manner similar to typical use during the tests.

The mode used for testing : Transmitting mode  
1. RF-550 + Standard Tag  
2. RF-550 + Standard Tag x 3

\*1. There is no difference in the fundamental and spurious emission levels between with and without Tag, and thus tests were performed with Tag.

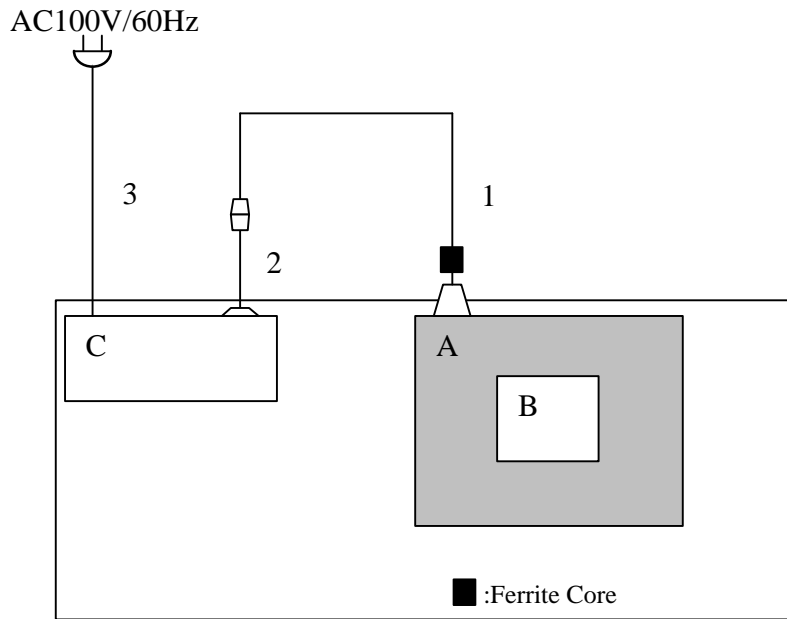
\*2. As for Transmitting mode 2:  
- RF-550: 75cm separation from each unit is recommended.  
As multiple units might be used at the same time, tests were performed with 3 units together as the worst case.

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

## 4.2 Configuration and peripherals

[for Conducted Emission test]

### Mode 1: RF-550 + Standard Tag



\* Cabling was 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	FCC ID	Remarks
A	RFID Standard Read/Write Head	RF-550	M003	KEYENCE CORPORATION	RF40773A	EUT
B	RFID Standard Tag	RF-T5F30	MT001	KEYENCE CORPORATION	-	-
C	Power Supply/Communication Unit	BL-U1	5103198	KEYENCE CORPORATION	-	-

### List of cables used

No.	Name	Model Number	Length (m)	Shield	Backshell Material
1	Main Cable	-	2.0m	N	Polyvinyl chloride
2	Extension Cable	NX-C08R	8.0m	N	Polyvinyl chloride
3	Main Power Cable	-	2.0m	N	Polyvinyl chloride

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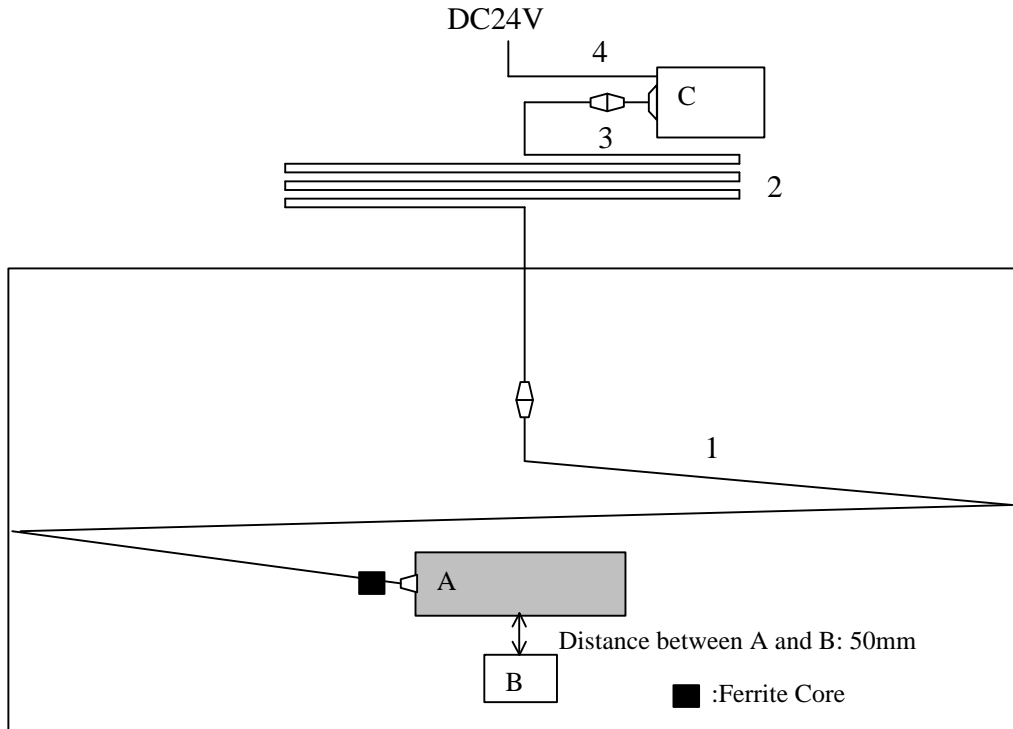
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[for Radiated Emission test]

Mode 1: RF-550 + Standard Tag



\* Cabling was 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	FCC ID	Remarks
A	RFID Standard Read/Write Head	RF-550	M003	KEYENCE CORPORATION	RF40773A	EUT
B	RFID Standard Tag	RF-T5F30	MT001	KEYENCE CORPORATION	-	-
C	Power Supply/Communication Unit	BL-U2	5749128	KEYENCE CORPORATION	-	-

List of cables used

No.	Name	Model Number	Length (m)	Shield	Backshell Material
1	Main Cable	-	2.0m	N	Polyvinyl chloride
2	Extension Cable	NX-C08R	8.0m	N	Polyvinyl chloride
3	D-sub conversion cable	RF-CM2D	0.2m	N	Polyvinyl chloride
4	DC Cable	-	0.5m	N	Polyvinyl chloride

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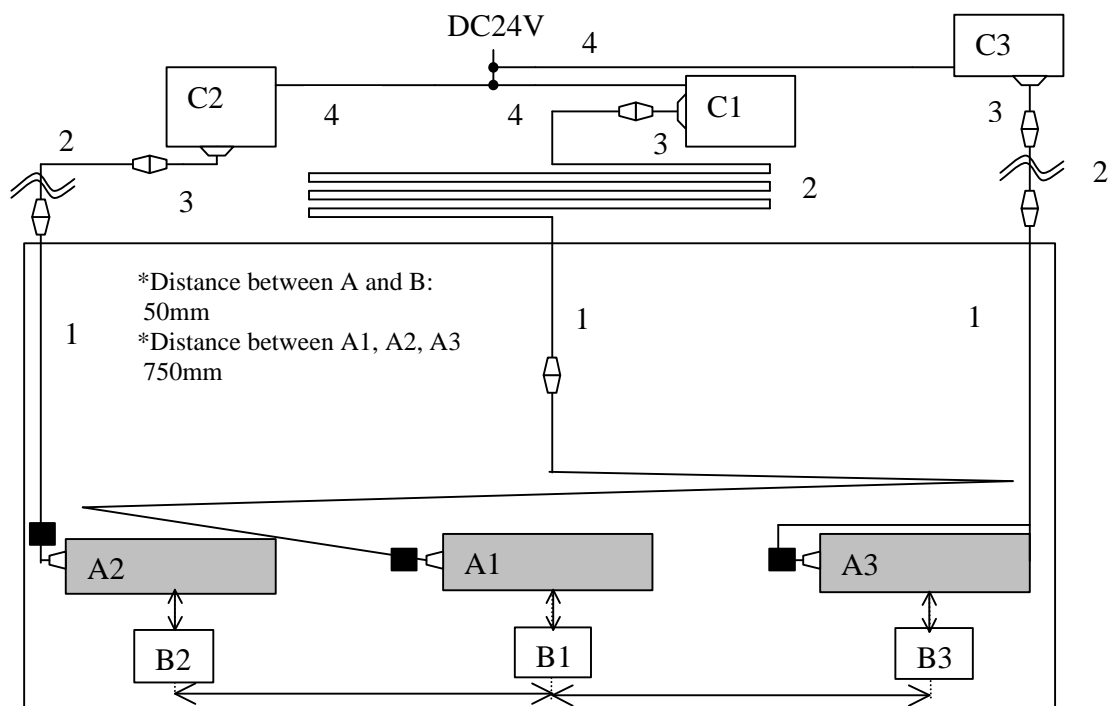
Facsimile : +81 596 24 8124

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[for Radiated Emission tests]

**Mode 2: RF-550 + Standard Tag x 3**



\* Cabling was taken into consideration and test data was taken under worse case conditions.

■:Ferrite Core

**Description of EUT and Support equipment**

No.	Item	Model number	Serial number	Manufacturer	FCC ID	Remarks
A1, A2, A3	RFID Standard Read/Write Head	RF-550	M001, M002, M003	KEYENCE CORPORATION	RF40773A	EUT
B1, B2, B3	RFID Standard Tag	RF-T5F30	MT001, MT011, MT005	KEYENCE CORPORATION	-	-
C1,C2,C3	Power Supply/Communication Unit	BL-U2	5749128, 4762172, 5726425	KEYENCE CORPORATION	-	-

**List of cables used**

No.	Name	Model Number	Length (m)	Shield	Backshell Material
1	Main Cable	-	2.0m	N	Polyvinyl chloride
2	Extension Cable	NX-C08R	8.0m	N	Polyvinyl chloride
3	D-sub conversion cable	RF-CM2D	0.2m	N	Polyvinyl chloride
4	DC Cable	-	0.5m	N	Polyvinyl chloride

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## **SECTION 5: Conducted emission**

### **5.1 Operating environment**

Test place : No.1 semi anechoic chamber.  
Temperature : See data  
Humidity : See data

### **5.2 Test configuration**

EUT was placed on a platform of nominal size, 0.5m by 1.0m, raised 80cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from LISN/AMN and excess AC cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/ an AMN to the input power source. All unused 50ohm connectors of the LISN/ AMN were resistively terminated in 50ohm when not connected to the measuring equipment. The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a horizontal conducting plane 4.0 x 4.0m and a vertical conducting plane 2.0 x 2.0m in a No.1 semi Anechoic Chamber. A drawing of the set up is shown in the photos of APPENDIX 1.

### **5.3 Test conditions**

Frequency range : 0.15MHz – 30MHz  
EUT position : Table top  
EUT operation mode : Transmitting

### **5.4 Test procedure**

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT in the semi Anechoic Chamber. The EUT was connected to a Line Impedance Stabilization Network (LISN)/ Artificial Mains Network (AMN). An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, with an average detector. The conducted emission measurements were made with the following detector function of the test receiver.

Detector Type : QP and AV  
IF Bandwidth : 9kHz

### **5.5 Test result**

Summary of the test results : Pass

Date : August 25, 2005                      Test engineer : Hiroka Umeyama

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

**6.1 Operating environment**

The test was carried out in a No.1 semi Anechoic Chamber

Temperature : See data  
Humidity : See data

**6.2 Test Procedure**

The Radiated Electric Field Strength intensity has been measured on No.1 semi anechoic chamber 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 each antenna angle 0deg. , 45deg. and 90deg.

Frequency : From 30MHz to 1GHz at distance 3m  
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 a QP, PK, and AV detector.  
The radiated emission measurements were made with the following detector function of the test receiver.

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

\* Part 15 Section 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])

**6.3 Test result**

Summary of the test results : Pass

Date : August 26 and 30, 2005      Test engineer : Hiroka Umeyama

### **SECTION 7: -20dB Bandwidth**

#### **Test Procedure**

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test data : APPENDIX 3  
Test result : Pass

### **SECTION 8: 99% Occupied Bandwidth**

#### **Test Procedure**

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test data : APPENDIX 3  
Test result : Pass

### **SECTION 9: Frequency Tolerance**

#### **Test Procedure**

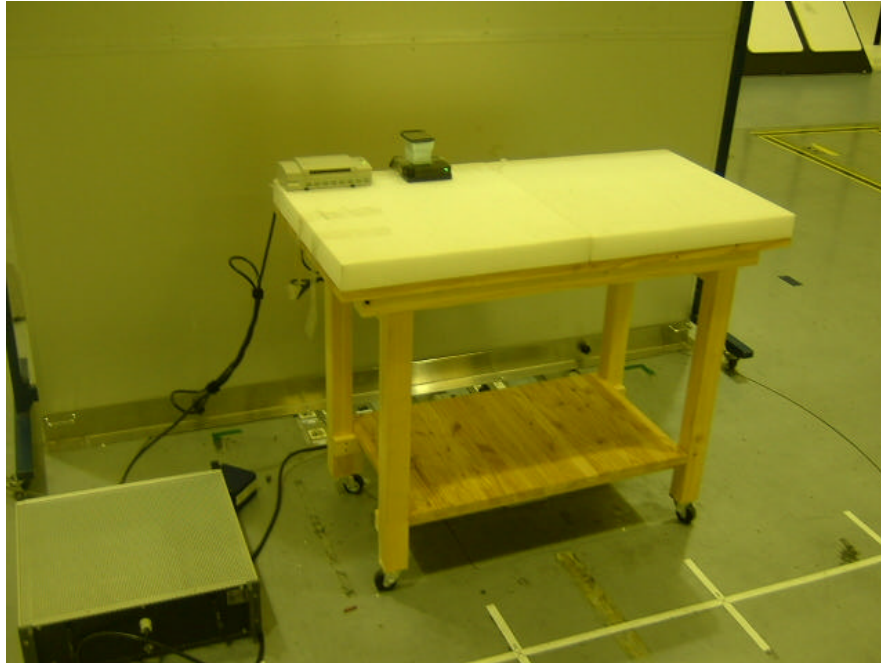
The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test data : APPENDIX 3  
Test result : Pass

**APPENDIX 1: Photographs of test setup**

**Conducted emission**

**Front**



**Rear**



**Radiated emission**  
**Front**



**Rear**

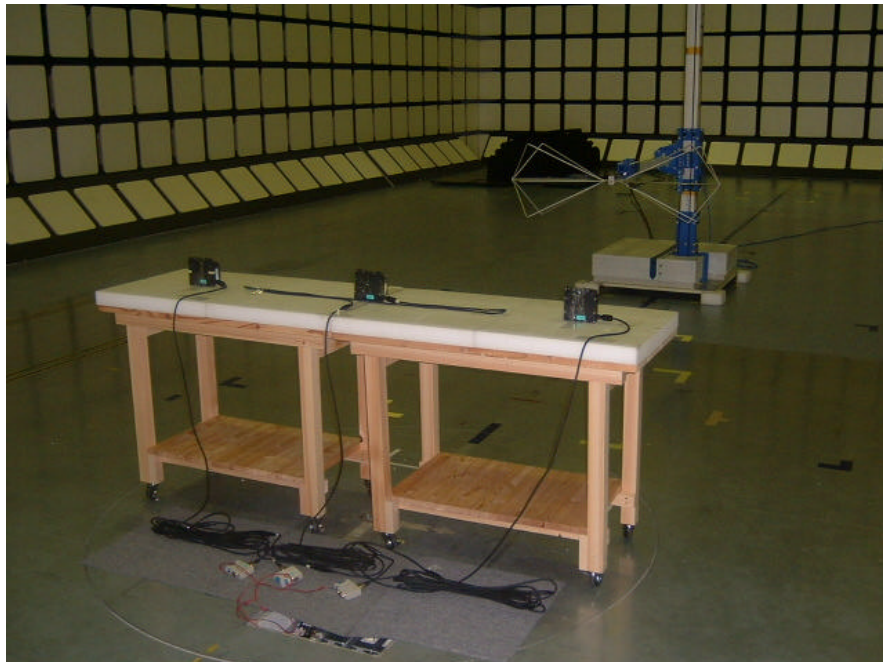


**Radiated emission: EUT x 3**

**Front**



**Rear**



**Worst Case Position: Y-axis**

**X-axis**



**Y-axis**





## Kinds of Tag

### Standard tag



## APPENDIX 2: Test instruments

### **EMI test equipment**

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-01	Anechoic Chamber	TDK	Semi Anechoic Chamber 10m	RE / CE	2004/11/13 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	RE / CE	2004/11/12 * 12
MLS-03	LISN(AMN)	Schwarzbeck	NSLK8127	CE	2004/11/10 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/Agilent/TSJ	-	CE	2004/12/24 * 12
MBA-01	Biconical Antenna	Schwarzbeck	BBA9106	RE	2004/10/14 * 12
MLA-01	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2004/10/14 * 12
MPA-04	Pre Amplifier	Agilent	8447D	RE	2005/05/24 * 12
MCC-01	Coaxial Cable 0.1-3000MHz	Suhner/storm/Agilent/TSJ	-	RE	2004/12/19 * 12
MAT-06	Attenuator(6dB)	Weinschel Corp	2	RE	2004/12/16 * 12
MLPA-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	RE	2004/12/10 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/Agilent/TSJ	-	RE	2004/12/24 * 12
MCC-31	coaxial cable	ULApex	-	RE	2005/06/02 * 12

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,

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**APPENDIX 3: Data of EMI test**

**Conducted Emission**

\* The carrier frequency, 13.56MHz is excluded.

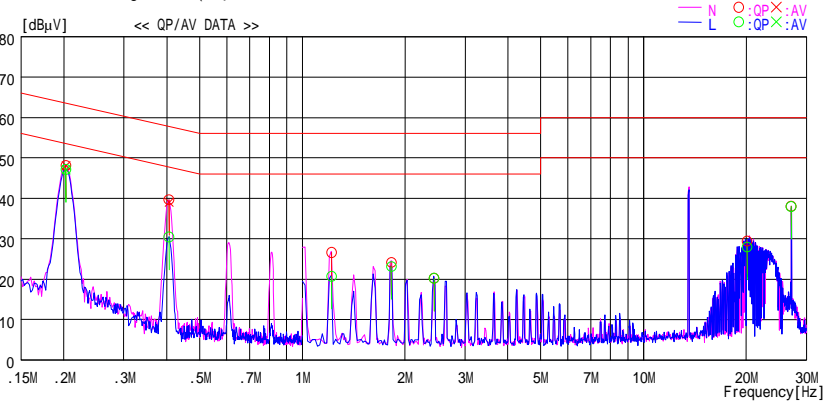
**DATA OF CONDUCTED EMISSION TEST**

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber  
 Date : 2005/08/25 11:43:40

Applicant : KEYENCE CORPORATION Report No. : 25IE0303-HO  
 Kind of EUT : RFID System Power : AC100V/60Hz(DC Power Supply)  
 Model No. : RF-550 Temp /Humi% : 24deg.C / 60%  
 Serial No. : M003 Operator : Hiroka Umeyama

Mode / Remarks : Transmitting Mode (13.56MHz) standard tag

LIMIT : FCC15C § 15.207 (QP)  
 FCC15C § 15.207 (AV)



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
0.20304	47.6	47.5	0.6	48.2	48.1	63.5	53.5	15.3	5.4	N
0.20304	46.6	46.5	0.6	47.2	47.1	63.5	53.5	16.3	6.4	L
0.40665	30.2	---	0.3	30.5	---	57.7	---	27.2	---	L
0.40665	39.4	38.7	0.3	39.7	39.0	57.7	47.7	18.0	8.7	N
1.21750	26.1	---	0.5	26.6	---	56.0	---	29.4	---	N
1.21750	20.2	---	0.5	20.7	---	56.0	---	35.3	---	L
1.82470	23.6	---	0.6	24.2	---	56.0	---	31.8	---	N
1.82470	22.5	---	0.6	23.1	---	56.0	---	32.9	---	L
2.43290	19.6	---	0.6	20.2	---	56.0	---	35.8	---	N
2.43290	19.6	---	0.6	20.2	---	56.0	---	35.8	---	L
20.12460	25.5	---	2.5	28.0	---	60.0	---	32.0	---	L
20.12460	26.9	---	2.5	29.4	---	60.0	---	30.6	---	N
27.11990	35.2	---	2.8	38.0	---	60.0	---	22.0	---	L
27.11990	35.3	---	2.8	38.1	---	60.0	---	21.9	---	N

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

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Issued date : September 8, 2005  
Revised date : September 15, 2005  
FCC ID : RF40773A

**Radiated emission:below 30MHz**  
**(Fundamental emission, Spectrum Mask and Spurious emission)**

**DATA OF MAGNETIC RADIATED EMISSION TEST**

UL Apex Co.,LTD. Head Office EMC Lab. No.1 Semi Anechoic Chamber  
Date : 2005/08/30 11:25:59

Applicant : KEYENCE CORPORATION Report No. : 25IE0303-HO  
Kind of EUT : RFID System Power : DC5V  
Model No. : RF-550 Temp./ Humi. : 24deg.C / 60%  
Serial No. : M003 Operator : Hiroka Umeyama

Mode / Remarks : Transmitting 13.56MHz, standard tag

LIMIT : FCC15C §15.225 3m  
All other spurious emissions were less than 20dB for the limit.

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]	
13.56000	75.8	QP	20.0	7.1	27.9	75.0	123.9	48.9	0deg	360	Y-Axis(MAX)
13.56000	74.3	QP	20.0	7.1	27.9	73.5	123.9	50.4	45deg	359	Y-Axis
13.56000	69.0	QP	20.0	7.1	27.9	68.2	123.9	55.7	90deg	265	Y-Axis
13.56000	64.2	QP	20.0	7.1	27.9	63.4	123.9	60.5	0deg	230	X-Axis
13.56000	69.2	QP	20.0	7.1	27.9	68.4	123.9	55.5	45deg	246	X-Axis
13.56000	63.6	QP	20.0	7.1	27.9	62.8	123.9	61.1	90deg	210	X-Axis
13.11000	43.8	QP	20.0	7.0	27.9	42.9	69.5	26.6	90deg	265	Y-Axis(MAX)
13.41000	43.3	QP	20.0	7.0	27.9	42.4	80.5	38.1	90deg	265	Y-Axis(MAX)
13.55300	64.6	QP	20.0	7.0	27.9	63.7	90.4	26.7	0deg	360	Y-Axis(MAX)
13.56700	63.0	QP	20.0	7.1	27.9	62.2	90.4	28.2	0deg	360	Y-Axis(MAX)
13.71000	40.0	QP	20.0	7.1	27.9	39.2	80.5	41.3	90deg	265	Y-Axis(MAX)
14.01000	37.6	QP	20.0	7.1	27.9	36.8	69.5	32.7	90deg	265	Y-Axis(MAX)
27.12000	25.1	QP	19.9	7.7	28.0	24.7	69.5	44.8	90deg	265	Y-Axis(MAX)

CHART : WITH FACTOR ANT TYPE : LOOP  
CALCULATION : READING + ANT FACTOR + LOSS( CABLE + ATTEN. -AMP.)

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MF060b(10.04.03)

Test report No. : 25IE0303-HO-2a  
Page : 21 of 26  
Issued date : September 8, 2005  
Revised date : September 15, 2005  
FCC ID : RF40773A

**Radiated emission**  
**(Fundamental emission, Spectrum Mask and Spurious emission :below 30MHz)**

**DATA OF MAGNETIC RADIATED EMISSION TEST**

UL Apex Co.,LTD. Head Office EMC Lab. No.1 Semi Anechoic Chamber  
Date : 2005/08/30 11:25:59

Applicant : KEYENCE CORPORATION Report No. : 25IE0303-HO  
Kind of EUT : RFID System Power : DC5V  
Model No. : RF-550 Temp./ Humi. : 24deg.C / 60%  
Serial No. : M001, M002, M003 Operator : Hiroka Umeyama

Mode / Remarks : Transmitting 13.56MHz, EUT x 3, 75cm, standard tag

LIMIT : FCC15C §15.225 3m  
All other spurious emissions were less than 20dB for the limit.

Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac		Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna	Table		Comment
			[dB/m]	[dB]						[deg]		
13.56000	82.5	QP	20.0	7.1	27.9	81.7	123.9	42.2	0deg	360	Y-Axis(MAX)	
13.56000	78.9	QP	20.0	7.1	27.9	78.1	123.9	45.8	45deg	360	Y-Axis	
13.56000	75.7	QP	20.0	7.1	27.9	74.9	123.9	49.0	90deg	95	Y-Axis	
13.56000	67.8	QP	20.0	7.1	27.9	67.0	123.9	56.9	0deg	90	X-Axis	
13.56000	67.2	QP	20.0	7.1	27.9	66.4	123.9	57.5	45deg	246	X-Axis	
13.56000	63.3	QP	20.0	7.1	27.9	62.5	123.9	61.4	90deg	300	X-Axis	
13.11000	43.6	QP	20.0	7.0	27.9	42.7	69.5	26.8	90deg	265	Y-Axis(MAX)	
13.41000	43.6	QP	20.0	7.0	27.9	42.7	80.5	37.8	90deg	95	Y-Axis(MAX)	
13.55300	71.1	QP	20.0	7.0	27.9	70.2	90.4	20.2	0deg	360	Y-Axis(MAX)	
13.56700	70.3	QP	20.0	7.1	27.9	69.5	90.4	20.9	0deg	360	Y-Axis(MAX)	
13.71000	43.2	QP	20.0	7.1	27.9	42.4	80.5	38.1	90deg	95	Y-Axis(MAX)	
14.01000	37.2	QP	20.0	7.1	27.9	36.4	69.5	33.1	90deg	95	Y-Axis(MAX)	
27.12000	29.3	QP	19.9	7.7	28.0	28.9	69.5	40.6	90deg	360	Y-Axis(MAX)	

CHART : WITH FACTOR ANT TYPE : LOOP  
CALCULATION : READING + ANT FACTOR + LOSS( CABLE + ATTEN. -AMP.)

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MF060b(10.04.03)



**Radiated emission (Spurious emission : above 30MHz)**

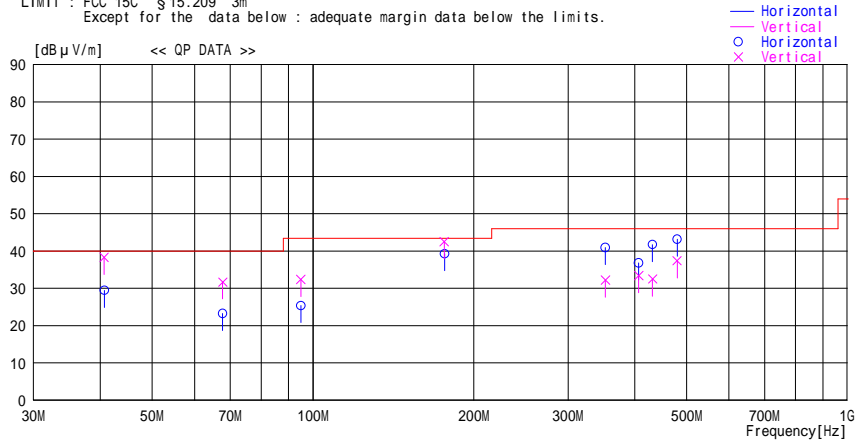
**DATA OF RADIATED EMISSION TEST**

UL Apex Co., Ltd. Head Office EMC Lab. No.1 Semi Anechoic Chamber  
Date : 2005/08/26 10:13:11

Applicant : KEYENCE CORPORATION Report No. : 25IE0303-HO  
Kind of EUT : RFID system Power : DC5V  
Model No. : RF-550 Temp /Humi% : 21deg.C / 60%  
Serial No. : M001,M002,M003 Operator : Hiroka Umeyama

Mode / Remarks : Transmitting 13.56MHz, standard tag, EUT x 3 , 75cm, Y-Axis

LIMIT : FCC 15C §15.209 3m  
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]
			Factor [dB/m]	Loss&Gain [dB]						
40.671	45.4	QP	13.6	-20.7	38.3	268	100	Vert.	40.0	1.7
40.672	36.6	QP	13.6	-20.7	29.5	359	274	Hori.	40.0	10.5
67.783	36.5	QP	7.2	-20.4	23.3	180	289	Hori.	40.0	16.7
67.796	44.9	QP	7.2	-20.4	31.7	272	100	Vert.	40.0	8.3
94.908	36.1	QP	9.3	-20.0	25.4	170	181	Hori.	43.5	18.1
94.919	43.1	QP	9.3	-20.0	32.4	294	100	Vert.	43.5	11.1
176.092	44.5	QP	16.5	-18.5	42.5	280	100	Vert.	43.5	1.0
176.272	41.3	QP	16.5	-18.5	39.3	330	180	Hori.	43.5	4.2
352.550	32.7	QP	16.5	-17.0	32.2	145	100	Vert.	46.0	13.8
352.554	41.4	QP	16.5	-17.0	40.9	359	100	Hori.	46.0	5.1
406.792	35.9	QP	18.0	-17.1	36.8	359	100	Hori.	46.0	9.2
406.798	32.5	QP	18.0	-17.1	33.4	160	100	Vert.	46.0	12.6
431.979	31.5	QP	18.2	-17.2	32.5	133	100	Vert.	46.0	13.5
432.003	40.7	QP	18.2	-17.2	41.7	70	100	Hori.	46.0	4.3
479.993	36.1	QP	18.5	-17.2	37.4	102	100	Vert.	46.0	8.6
480.000	41.9	QP	18.5	-17.2	43.2	65	100	Hori.	46.0	2.8

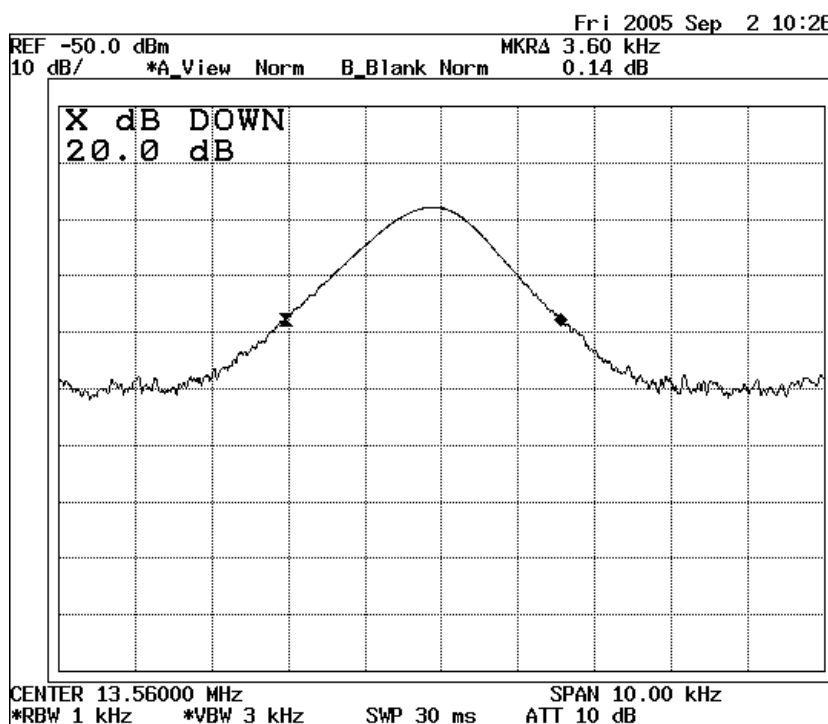
CHART: WITH FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN  
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

### -20dB Bandwidth

UL Apex Co., Ltd.  
Head Office EMC Lab. No.3 Measurement Room

COMPANY : KEYENCE CORPORATION	REPORT NO. : 25IE0303-HO
EQUIPMENT : Radio Frequency Identification System	REGULATION : FCC15.225
MODEL : RF-550	TEST DISTANCE : 3m
S/ N : M003	DATE : 09/01/2005
POWER : DC5V	TEMPERATURE : 23 deg. C
MODE : Transmitting , standard tag	HUMIDITY : 56 %
	ENGINEER : Hiroka Umeyama

FREQ	Result
[MHz]	[kHz]
13.56	3.60



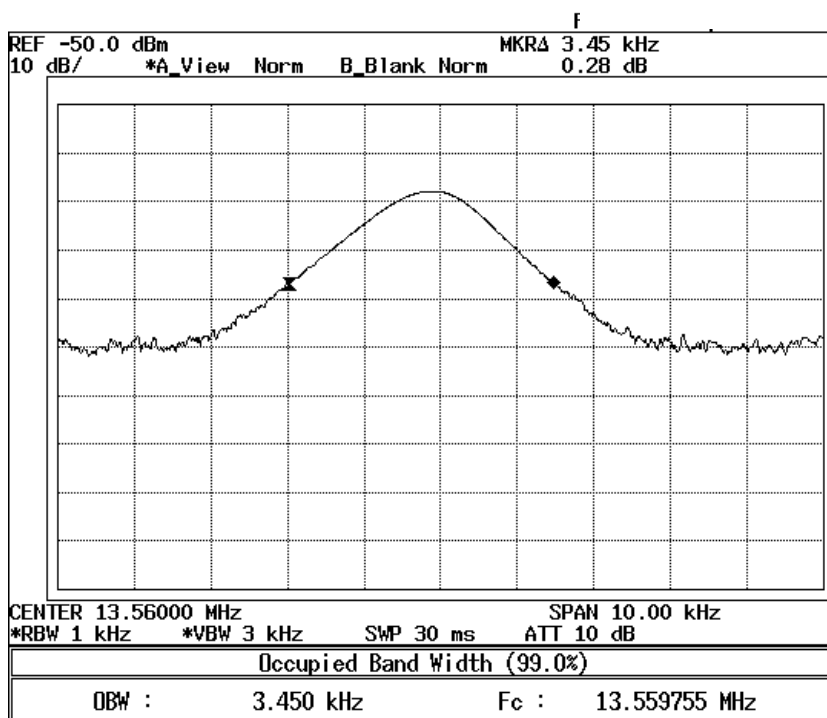


### 99% Occupied Bandwidth

UL Apex Co., Ltd.  
Head Office EMC Lab. No.3 Measurement Room

COMPANY : KEYENCE CORPORATION	REPORT NO. : 25IE0303-HO
EQUIPMENT : Radio Frequency Identification System	REGULATION : FCC15.225
MODEL : RF-550	TEST DISTANCE : 3m
S/ N : M003	DATE : 09/01/2005
POWER : DC5V	TEMPERATURE : 23 deg. C
MODE : Transmitting , standard tag	HUMIDITY : 56 %
	ENGINEER : Hiroka Umeyama

FREQ	Result
[MHz]	[kHz]
13.56	3.45



## Frequency Stability

UL Apex Co., Ltd.  
Head Office EMC Lab. No.3 Measurement Room

COMPANY	: KEYENCE CORPORATION	REPORT NO.	: 25IE0303-HO
EQUIPMENT	: Radio Frequency Identification System	REGULATION	: FCC15.225
MODEL	: RF-550	TEST DISTANCE	: 3m
S/ N	: M003	DATE	: 09/01/2005
POWER	: DC5V	TEMPERATURE	: 23 deg. C
MODE	: Transmitting	HUMIDITY	: 56 %
		ENGINEER	: Hiroka Umeyama

Test Condition	Test Timing	FREQ [MHz]	Result	Limit	Margin
T min -20	Power on	13.559921	-0.000583%	0.010000%	0.009417%
	on 2min.	13.559921	-0.000583%	0.010000%	0.009417%
	on 5min.	13.559921	-0.000583%	0.010000%	0.009417%
	on 10min.	13.559919	-0.000597%	0.010000%	0.009403%
T max 50	Power on	13.559663	-0.002487%	0.010000%	0.007513%
	on 2min.	13.559663	-0.002487%	0.010000%	0.007513%
	on 5min.	13.559627	-0.002751%	0.010000%	0.007249%
	on 10min.	13.559663	-0.002487%	0.010000%	0.007513%

Limit : 13.56 MHz +/-0.01 %