EMC TEST REPORT

Issued: October 21, 2013

Name and Address of the Client:	TAKENAKA ENGINEERING CO., LTD. 83-1 Gojyo-dori, Sotokan Nishi-iru, Higashino, Yamashina-ku, Kyoto 607-8156, Japan
Test Item:	FLAME SENSOR WITH SPEAKER
Identification:	FS-3500E
Serial No.:	Lot3063(No.1) / Lot3063(No.2)
Sample No.:	2
Sample Receipt Date:	September 6, 2013 September 26, 2013
Test Specification:	EN 61000-6-3:2007 + A1:2011 EN 50130-4:2011 EN 61000-4-2:2009 EN 61000-4-3:2006 + A1:2008 + A2:2010 EN 61000-4-4:2012 EN 61000-4-5:2006 EN 61000-4-6:2009
Date of Testing:	September 13, 18, 19, 20 and 27, 2013
Test Result:	PASS

Representative Test Engineer: H. Deguchi (2013-10-21)

Reviewed by: H. Onishi, EMC Manager (2013-10-21)
iNARTE : EMC-003318-NT

Other Aspects:

Abbreviations:
PASS = passed
FAIL = failed
N/A = not applicable

Note:
This Test Report should not be reproduced except in full, without the written approval of Cosmos Corporation.
The test result of this Test Report is based on the tests made for sample provided, and it is not applicable to individual product identical to the sample or similar product.
The judgment of this test report validates the test item only specified in "5. Summary of Test Results".

Contents

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1. General

This report describes the electromagnetic compatibility of the tested product. If the tested product will be used with additional equipment other than those mentioned in this report or if tested product will be used against the manufacturer's specification, the compliance with relevant standards for the system needs to be ensured.

2. Test Facility

The measurement was carried out at the following facility.

[Radiated Emission]
Cosmos Corporation EMC Lab 2
519 Shimesasu, Watarai-cho, Watarai-gun, Mie-ken 516-2119, Japan
☒O.A.T.S 3 & 10 m
☐Shielded Room

Cosmos Corporation EMC Lab 2 is accredited in accordance with the International Standard ISO/IEC 17025 by the following accreditation bodies and the test facility is registered by the following bodies.

Accreditation: A2LA Accredited Laboratory. No. 2900.01
Nemko Laboratory Authorisation. No. ELA 621

Registration: FCC Registration No. 90522
VCCI Registration No. R-975, C-1019, T-1926, G-435
Industry Canada Registration No. 3958D

[Immunity]
Cosmos Corporation EMC Lab. Oonoki
3571-2 Oonoki, Watarai-cho, Watarai-gun, Mie-ken 516-2102, Japan
☒Semi anechoic Chamber 3 m
☒Shielded Room

Cosmos Corporation EMC Lab. Oonoki is accredited in accordance with the International Standard ISO/IEC 17025 by the following accreditation bodies and the test facility is registered by the following bodies.

Accreditation: A2LA Accredited Laboratory. No. 2900.01
Nemko Laboratory Authorisation. No. ELA 621

Registration: FCC Registration No. 604492
Industry Canada Registration No. 3958B

3. Description of the Tested Sample

TAKENAKA ENGINEERING CO., LTD., Model FS-3500E (referred to as the EUT in this report) is FLAME SENSOR WITH SPEAKER.

3.1 Rating

Rated Voltage	Rated Current
DC 3 V/DC 10-30 V	Less than 300 mA

Input power condition during the test was DC 12 V (Manufacturer's Specification).
Highest internal frequency: 4.09 MHz

Note: The Serial No. Lot3063(No.1) was used during the test except for EN 61000-4-2.
The Serial No. Lot3063(No.2) was used during the test of EN 61000-4-2. (Please refer to Appendix E)

4. Test Condition (Manufacturer's Specification)

4.1 Mode of Operation

Mode of operation: Mode ①

[Details of Mode]
Mode ①: Continuous Operating (Stand-by)

4.2 Additional Equipment

The equipment was tested together with additional peripherals.
The following peripherals were used during the tests:

Instrument	Model	Serial No.	Rating
DC Power Supply	PAN 60-6A	JJ003763	AC 100 V, 50/60 Hz, 800 VA
DC Power Supply	PAN 60-10A	HC000143	AC 100 V, 50/60 Hz, 1300 VA
Digital Multimeter	73203	5540497	DC 3 V (Two AAA Dry Cells), 500 mA

4.3 Configuration

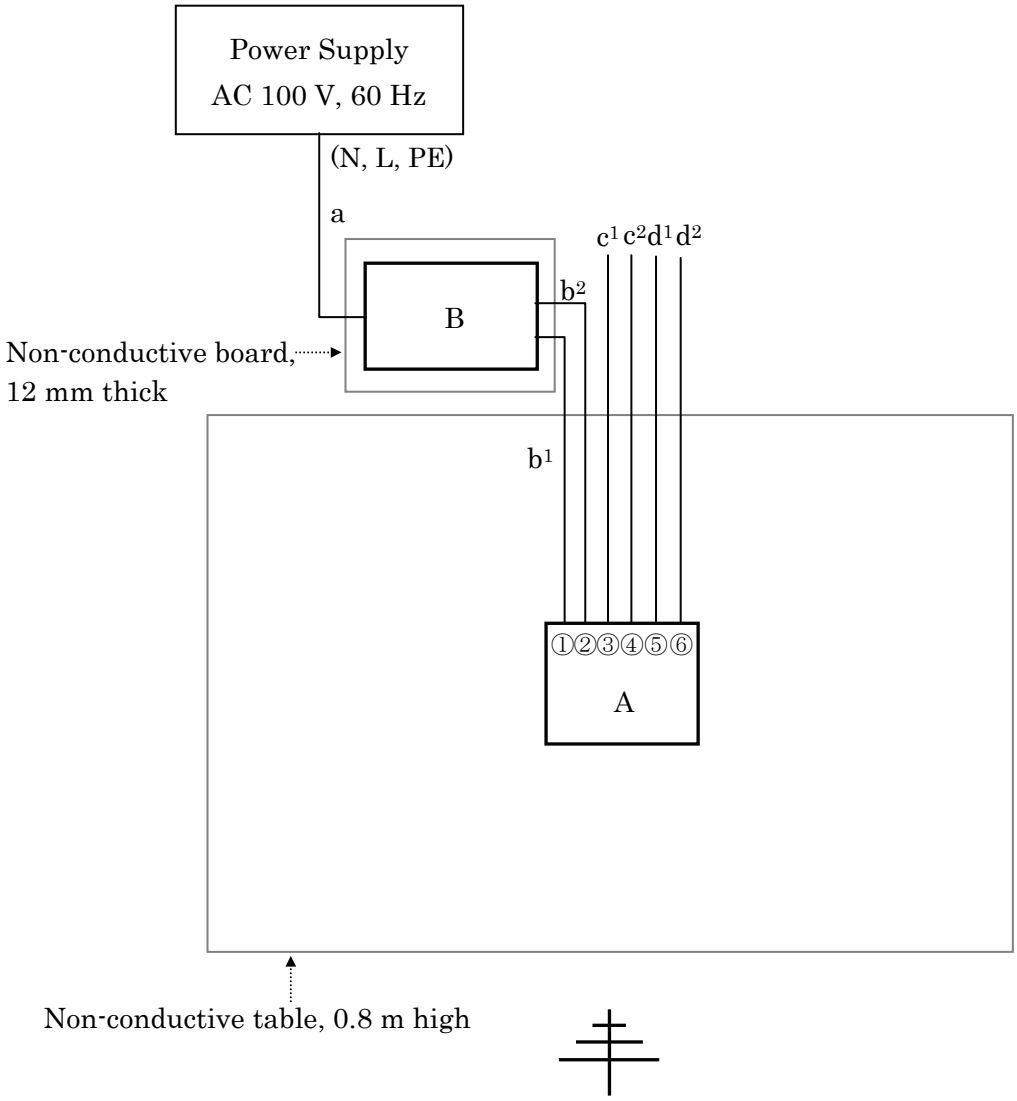
[Emission]

	Instrument	Model		Cable	Length	Shield
A	EUT	FS-3500E	a	AC Power Cord	1.8 m	×
B	DC Power Supply	PAN 60-6A	b^1	DC Power Cord (+)	3.0 m	×
			b^2	DC Power Cord (−)	3.0 m	×
			c^1	Alarm1 Cable *	3.0 m	×
			c^2	Alarm2 Cable *	3.0 m	×
			d^1	Tamper1 Cable *	3.0 m	×
			d^2	Tamper2 Cable *	3.0 m	×

Note: *: The termination of these cables were opened.

4.3 Configuration (Continued)

Radiated Emission



Note: The EUT was placed on the non-conductive board, 0.05 m high.

Excess cable arrangement

Radiated Emission

Symbol	Length	Position	Setting
b^1, b^2	0.3 m	center	Bundle
c^1, c^2, d^1, d^2	0.3 m	end	Bundle and Hung

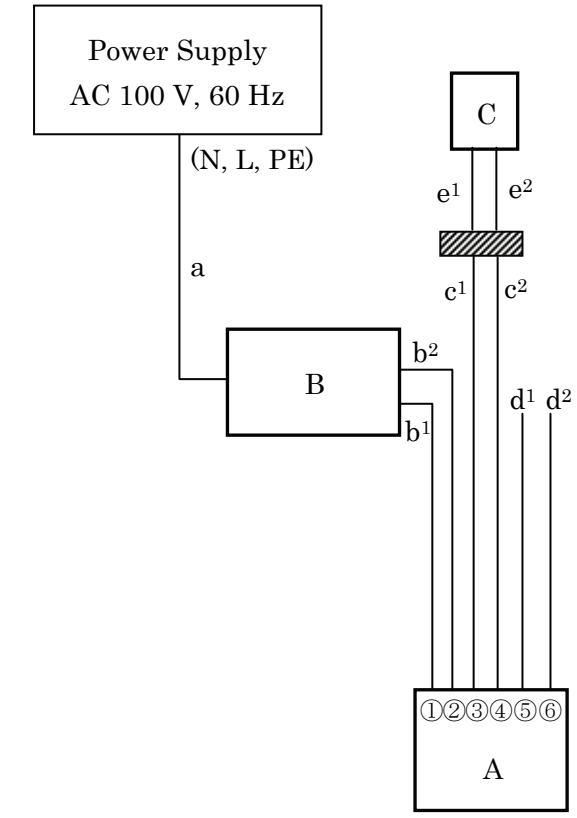
4.3 Configuration (Continued)

[Immunity]

	Instrument	Model		Cable	Length	Shield
A	EUT	FS-3500E	a	AC Power Cord	3.0 m	×
B	DC Power Supply	PAN 60-10A	b1	DC Power Cord (+)	3.0 m	×
C	Digital Multimeter	73203		DC Power Cord (+) *1	0.5 m	×
				DC Power Cord (+) *2	0.3 m	×
			b2	DC Power Cord (−)	3.0 m	×
				DC Power Cord (−) *1	0.5 m	×
				DC Power Cord (−) *2	0.3 m	×
			c1	Alarm1 Cable	3.0 m	×
				Alarm1 Cable *3	0.5 m	×
			c2	Alarm2 Cable	3.0 m	×
				Alarm2 Cable *3	0.5 m	×
			d1	Tamper1 Cable *4	3.0 m	×
				Tamper1 Cable *3 *4	0.5 m	×
			d2	Tamper2 Cable *4	3.0 m	×
				Tamper2 Cable *3 *4	0.5 m	×
			e1	Test Lead	1.1 m	×
			e2	Test Lead	1.1 m	×

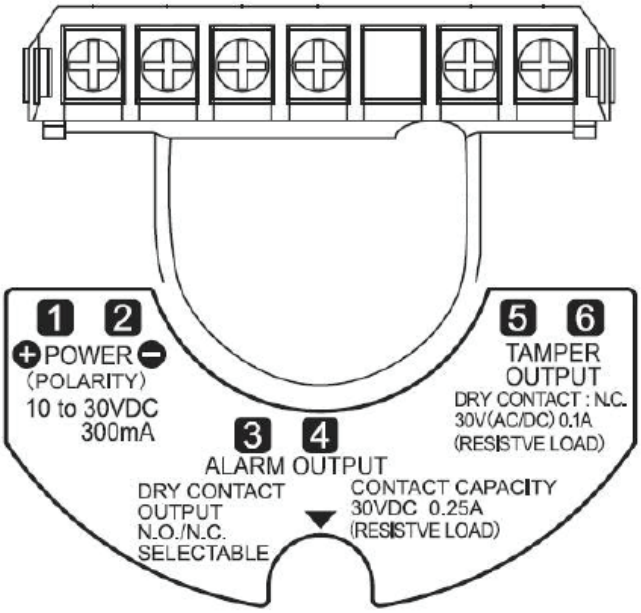
Note: *1: These cords were used during the tests of EN 61000-4-4 and EN 61000-4-5.
*2: These cords were used during the test of EN 61000-4-6.
*3: These cables were used during the test of EN 61000-4-5.
*4: The termination of these cables were opened.

4.3 Configuration (Continued)

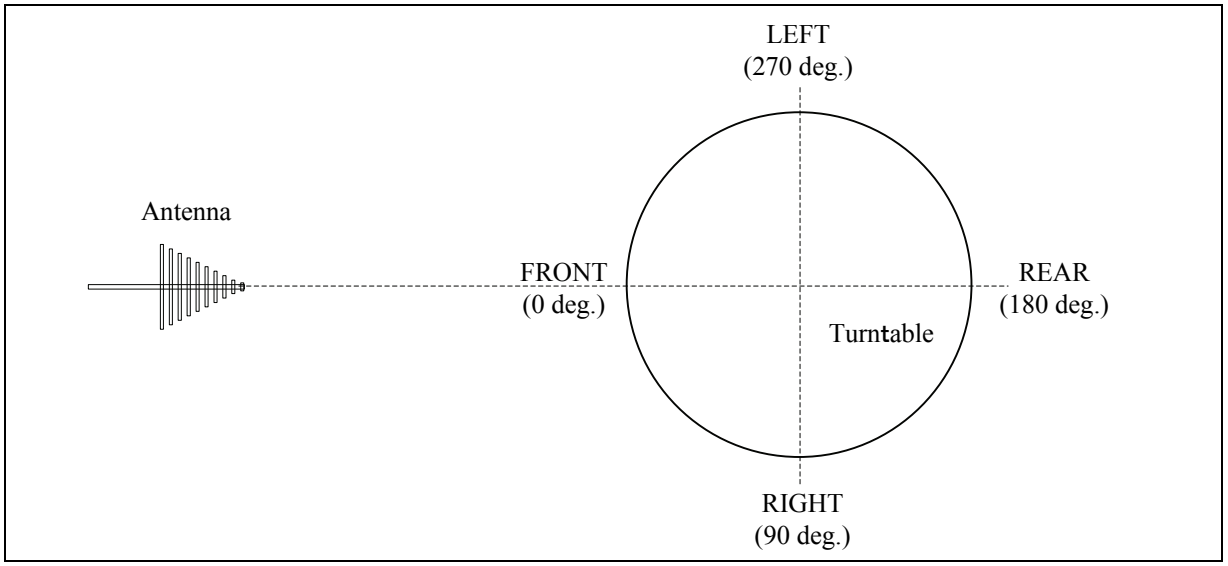


Note: The EUT was placed on the non-conductive board, 0.05 m high.

[Terminal Configuration]

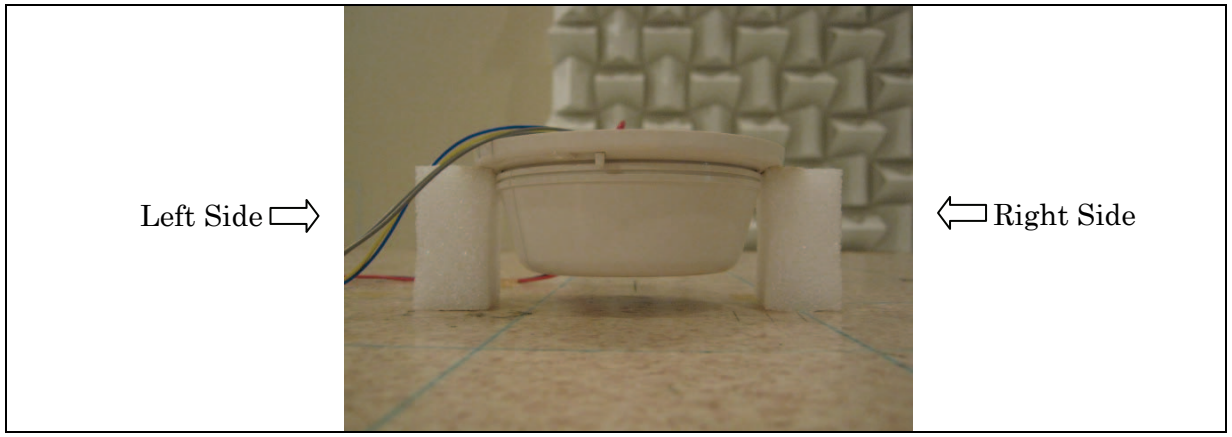


4.4 EUT Angle

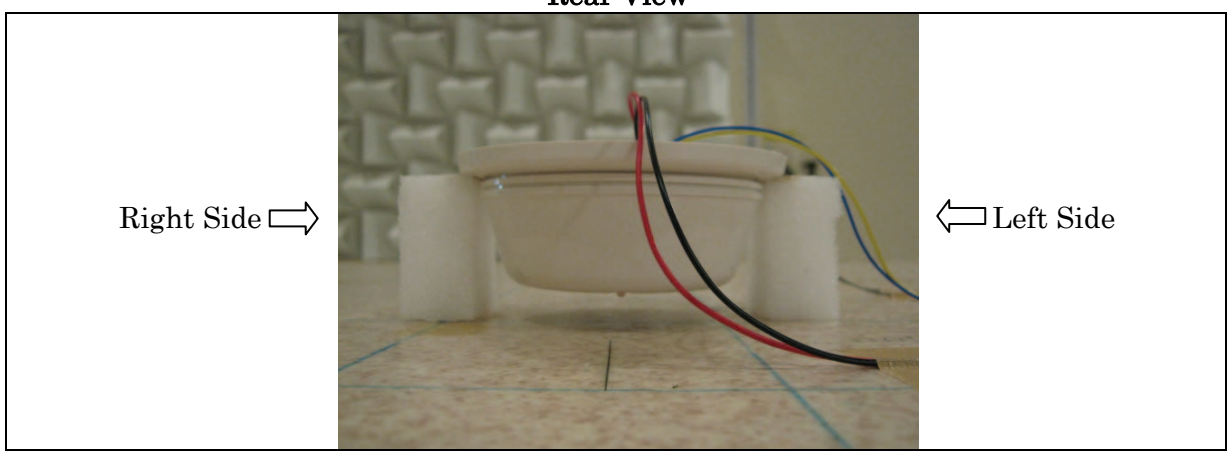


4.5 Photograph of EUT

Front View



Rear View



5. Summary of Test Results

These test results are the test results of the condition specified with "4. Test Condition".

[Emission] EN 61000-6-3:2007 + A1:2011

Environmental phenomena	Standard	Result
Radiated Disturbance (30 MHz to 1 GHz)	EN 61000-6-3	PASS
Radiated Disturbance (above 1 GHz)	EN 61000-6-3	N/A *1
Conducted Common Mode Disturbance at Telecommunication Port	EN 61000-6-3	N/A *2
Conducted Disturbance at Mains Terminal Port (AC Power Port)	EN 61000-6-3	N/A *2
Conducted Disturbance at Mains Terminal Port (DC Power Port)	EN 61000-6-3	N/A *3
Harmonic Current	EN 61000-3-2 (Class A)	N/A *2
Voltage Fluctuations and Flicker	EN 61000-3-3	N/A *2

Note: *1: This item does not apply because the highest internal frequency of this equipment is less than 108 MHz.
*2: This item does not apply because there is no port which is tested in this equipment.
*3: This item does not apply because this equipment is not intended to connect to a local DC power network or a local battery by a connecting cable exceeding a length of 30 m.

5. Summary of Test Results (Continued)

[Immunity] EN 50130-4:2011

Environmental phenomena		Basic standard	Required performance criteria	Result
Enclosure Port	Electrostatic Discharge	EN 61000-4-2	Refer to Appendix C	PASS
	Radiated Electromagnetic Field	EN 61000-4-3	Refer to Appendix C	PASS
Signal Lines	Fast Transient / Bursts	EN 61000-4-4	Refer to Appendix C	PASS
	Slow High Energy Surge	EN 61000-4-5	Refer to Appendix C	PASS
	Conducted Disturbances, Induced by Electromagnetic Fields	EN 61000-4-6	Refer to Appendix C	PASS
DC Power Lines	Fast Transient / Bursts	EN 61000-4-4	Refer to Appendix C	PASS
	Slow High Energy Surge	EN 61000-4-5	Refer to Appendix C	PASS
	Conducted Disturbances, Induced by Electromagnetic Fields	EN 61000-4-6	Refer to Appendix C	PASS
AC Mains Supply Lines	Fast Transient / Bursts	EN 61000-4-4	Refer to Appendix C	N/A *
	Slow High Energy Surge	EN 61000-4-5	Refer to Appendix C	N/A *
	Conducted Disturbances, Induced by Electromagnetic Fields	EN 61000-4-6	Refer to Appendix C	N/A *
	Voltage Dips and Short Interruptions	EN 61000-4-11	Refer to Appendix C	N/A *

Note: *: This item does not apply because there is no port which is tested in this equipment.

6. Test Results Emission

6.1 Enclosure Port

6.1.1 Radiated Disturbance (Radiated Emission)

Result: PASS

In the frequency range from 30 MHz to 1 GHz, the Electric Field Strength was measured according to EN 61000-6-3:2007 + A1:2011.
The test setup was made according to EN 61000-6-3:2007 + A1:2011 on the turntable installed in dome at open-site. The non-conductive table, 0.8 m high, was placed on the turntable, and the EUT was put on the non-conductive table. The measurement was carried out with both horizontal and vertical antenna polarization. The turntable was fully rotated. The highest radiation from the equipment was recorded. By varying the configuration of the test sample and the cable routing, it was attempted to maximize the emission. For further description of the configuration, refer to the pictures of this report.

Distance between equipment and antenna: 10 m
Height of antenna: 1 m to 4 m

Mode of operation: Mode ①

Uncertainty of measurement result: ±4.71 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

U_{lab} is less than or equal to U_{cispr} of Table1 of EN 55016-4-2:2004.

For more details of the test results, refer to Appendix D, Emission Test Data.

The measurement employed transmission lines of the testing facility, cable loss data of which was measured in condition that the ambient temperature did not exceed ±15℃ from the other of the date of the measurement.

7. Test Results Immunity

7.1 Enclosure Port

7.1.1 Electrostatic Discharge

Result: **PASS**

The immunity against electrostatic discharge was tested according to EN 61000-4-2:2009.
The EUT was placed on the non-conductive table. The height of this table was 0.8 m.
A horizontal coupling plane (HCP), were placed on the table. The EUT and its cables were isolated from the coupling plane by an insulating support 0.5 mm in thickness.

Charge voltage:	2 kV / 4 kV / 6 kV (Contact Discharge)
	2 kV / 4 kV / 8 kV (Air Discharge)
Polarity:	positive / negative
Number of discharges:	10
Mode of operation:	Mode ①
Required performance criterion:	Please refer to Appendix C

Date of testing:	September 27, 2013
Room temperature:	22℃
Relative humidity:	43%
Atmospheric pressure:	1015 hPa

7.1.1 Electrostatic Discharge (Continued)

Table 1: Electrostatic Discharge

Air Discharge

Position	Positive			Negative		
	2 kV	4 kV	8 kV	2 kV	4 kV	8 kV
Enclosure	P	P	P	P	P	P
LED	P	P	P	P	P	P

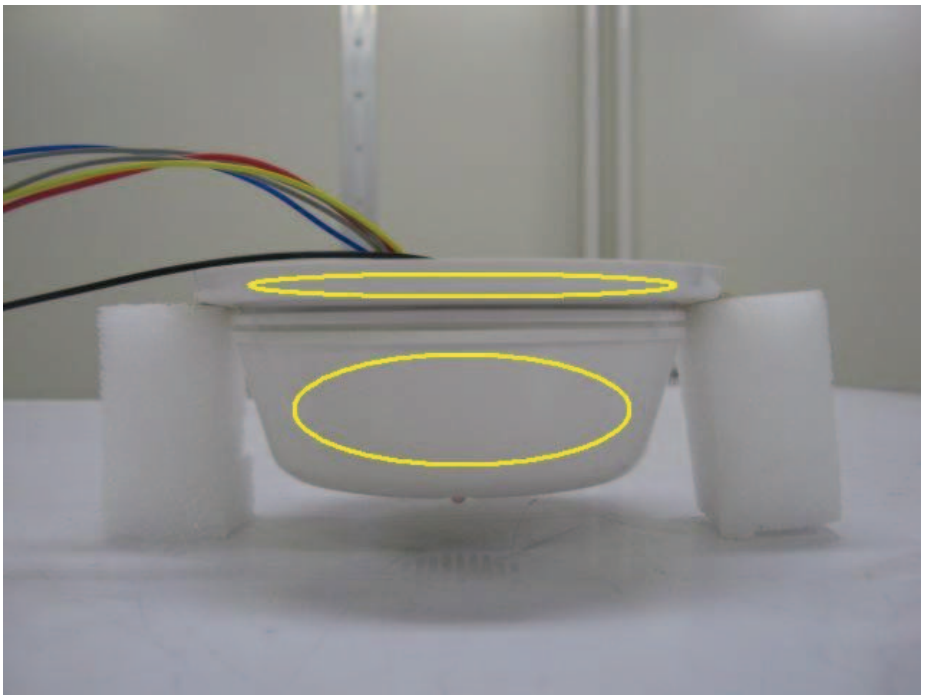
Contact Discharge

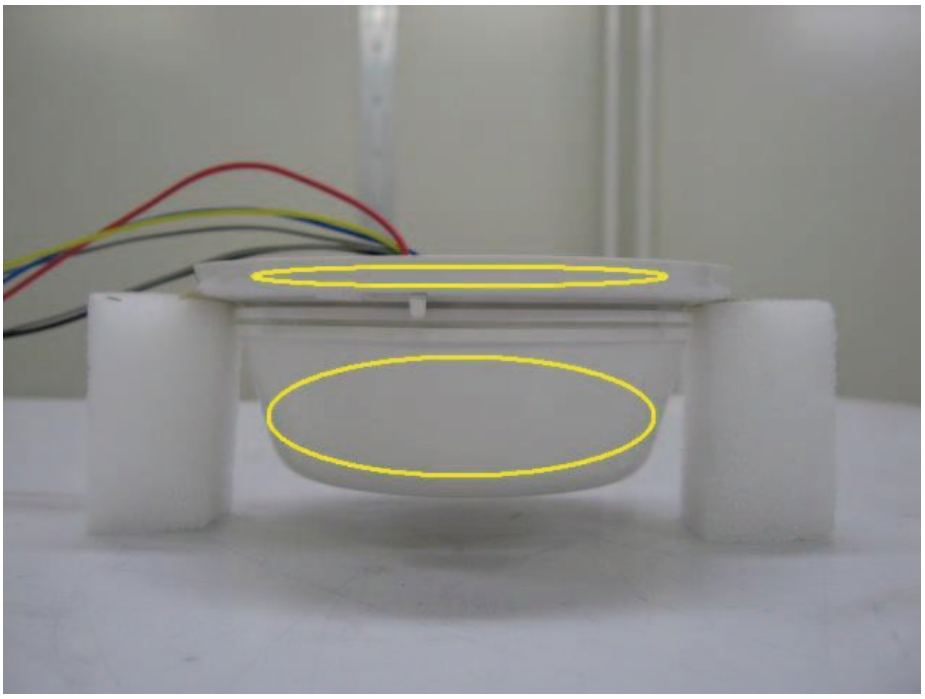
Position		Positive			Negative		
		2 kV	4 kV	6 kV	2 kV	4 kV	6 kV
Screw		P	P	P	P	P	P
Wire Mesh		P	P	P	P	P	P
VCP	Front Side *	P	P	P	P	P	P
	Right Side *	P	P	P	P	P	P
	Rear Side *	P	P	P	P	P	P
	Left Side *	P	P	P	P	P	P
HCP	Front Side *	P	P	P	P	P	P
	Right Side *	P	P	P	P	P	P
	Rear Side *	P	P	P	P	P	P
	Left Side *	P	P	P	P	P	P

Note: P : Pass and No disturbance of function.
* : For these directions, please refer to page 9, Photograph of EUT.

7.1.1 Electrostatic Discharge (Continued)

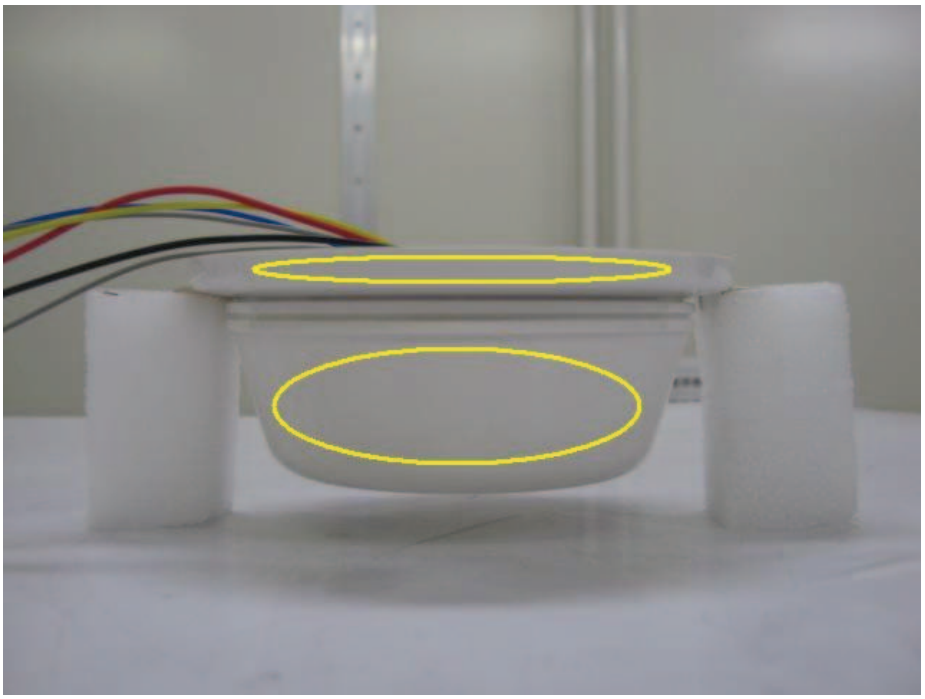
×…Contact Discharge ○…Air Discharge

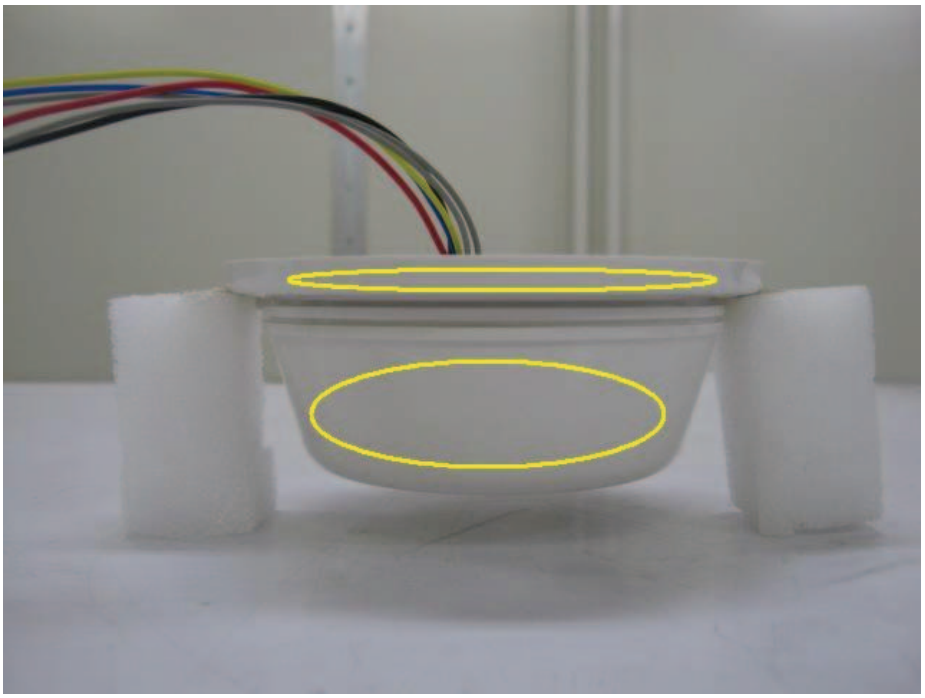




7.1.1 Electrostatic Discharge (Continued)

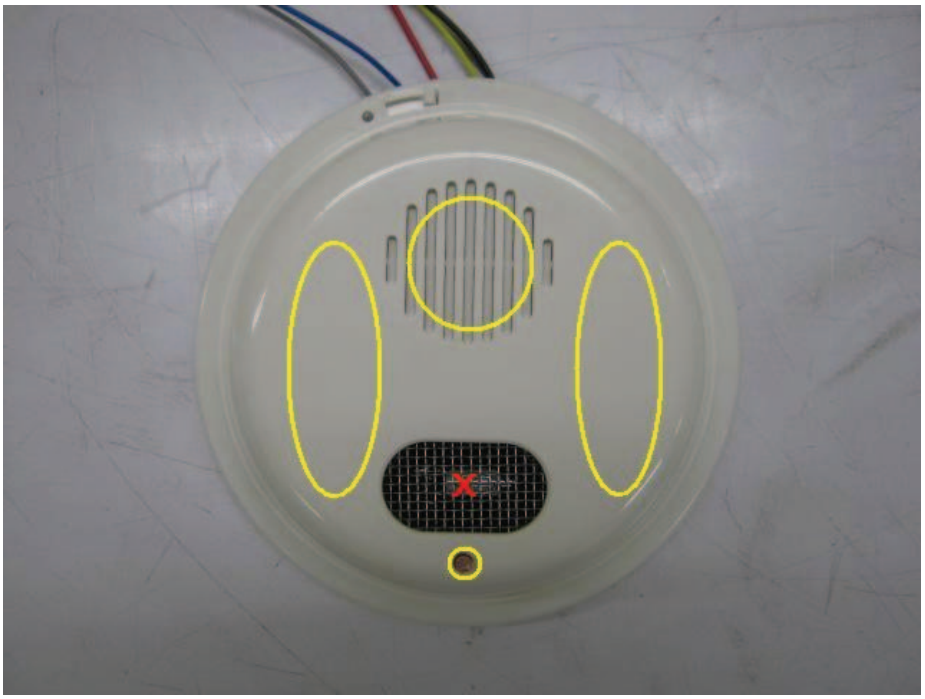
×…Contact Discharge ○…Air Discharge

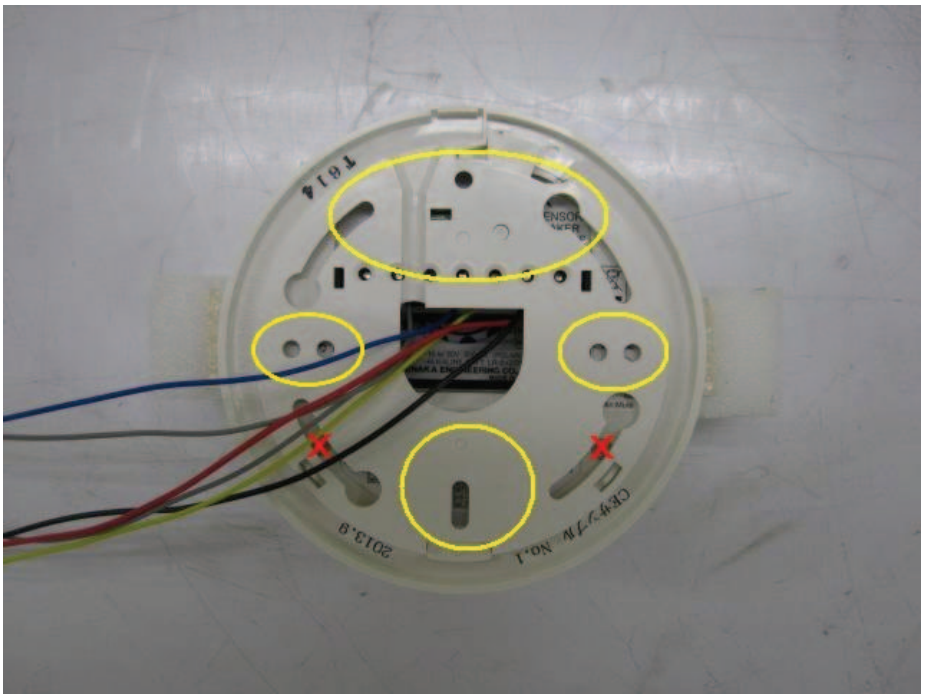




7.1.1 Electrostatic Discharge (Continued)

×…Contact Discharge ○…Air Discharge





7.1.2 Radiated Electromagnetic Fields

Result: **PASS**

The immunity against radiated electromagnetic fields was tested according to EN 61000-4-3:2006 + A1:2008 + A2:2010 in a semi-anechoic chamber. The EUT was placed on a non-conductive table. The height of this table was 0.8 m. The antenna was orientated for both horizontal and vertical polarization. The test was performed with the antenna facing each of the four sides of the EUT.

Field strength:	10 V/m
Frequency range:	80 MHz to 2.7 GHz
Modulation:	80% AM (1 kHz)
	Pulse 1 Hz (0.5 s ON: 0.5 s OFF)
Step size:	1%
Dwell time:	3 s
Mode of operation:	Mode ①
Required performance criterion:	Please refer to Appendix C

Date of testing:	September 19, 2013	September 20, 2013
Room temperature:	22℃	23℃
Relative humidity:	43%	46%
Atmospheric pressure:	1017 hPa	1017 hPa

7.1.2 Radiated Electromagnetic Fields (Continued)

Table 2a: Radiated Electromagnetic Fields, Field Strength 10 V/m
80% AM (1 kHz)

Position	Result		Remarks
	horizontal	vertical	
Front Side *	PASS	PASS	Equipment operated as intended. No disturbance of function.
Right Side *	PASS	PASS	Equipment operated as intended. No disturbance of function.
Rear Side *	PASS	PASS	Equipment operated as intended. No disturbance of function.
Left Side *	PASS	PASS	Equipment operated as intended. No disturbance of function.

Table 2b: Radiated Electromagnetic Fields, Field Strength 10 V/m
Pulse 1 Hz (0.5 s ON: 0.5 s OFF)

Position	Result		Remarks
	horizontal	vertical	
Front Side *	PASS	PASS	Equipment operated as intended. No disturbance of function.
Right Side *	PASS	PASS	Equipment operated as intended. No disturbance of function.
Rear Side *	PASS	PASS	Equipment operated as intended. No disturbance of function.
Left Side *	PASS	PASS	Equipment operated as intended. No disturbance of function.

Note: *: For these directions, please refer to page 9, Photograph of EUT.

7.2 Signal Lines

7.2.1 Fast Transient / Bursts on Signal Lines

Result: **PASS**

The immunity against fast transient / bursts on signal lines was tested according to EN 61000-4-4:2012. The EUT was placed on a non-conductive board 0.1 m above the reference ground plane. The capacitive coupling clamp was placed directly on the reference ground plane.

Test voltage:	1 kV
Polarity:	positive / negative
Repetition frequency:	100 kHz
Rise time of one pulse:	5 ns ±30%
Impulse duration (50% Value):	50 ns ±30%
Test duration:	1 min.
Mode of operation:	Mode ①
Required performance criterion:	Please refer to Appendix C

Date of testing:	September 18, 2013
Room temperature:	24℃
Relative humidity:	43%
Atmospheric pressure:	1015 hPa

Table 4: Fast Transient / Bursts, Signal Lines

Line	Result		Remarks
	Positive Polarity	Negative Polarity	
Alarm1 Cable	1 kV PASS	1 kV PASS	Equipment operated as intended. No disturbance of function.
Alarm2 Cable	1 kV PASS	1 kV PASS	Equipment operated as intended. No disturbance of function.
Tamper1 Cable	1 kV PASS	1 kV PASS	Equipment operated as intended. No disturbance of function.
Tamper2 Cable	1 kV PASS	1 kV PASS	Equipment operated as intended. No disturbance of function.

7.2.2 Slow High Energy Surge on Signal Lines

Result: **PASS**

Slow high energy surge on signal lines was tested according to EN 61000-4-5:2006.
The EUT was placed on a non-conductive board 0.1 m above the reference ground plane.

Test voltage:	0.5 kV / 1 kV line to ground
Wave shape, open circuit:	Front time 1.2 µs ±30% (Voltage)
	Time to half value 50 µs ±20% (Voltage)
Wave shape, short circuit:	Front time 8 µs ±20% (Current)
	Time to half value 20 µs ±20% (Current)
Polarity:	positive / negative
Number of surges:	5
Repetition rate:	1 min.
Mode of operation:	Mode ①
Required performance criterion:	Please refer to Appendix C

Date of testing:	September 20, 2013
Room temperature:	22℃
Relative humidity:	44%
Atmospheric pressure:	1015 hPa

Table 5: Slow High Energy Surge, Signal Lines

Line	Result		Remarks
	Positive Polarity	Negative Polarity	
Alarm1 Cable	0.5 kV PASS	0.5 kV PASS	Equipment operated as intended.
	1 kV PASS	1 kV PASS	No disturbance of function
Alarm2 Cable	0.5 kV PASS	0.5 kV PASS	Equipment operated as intended.
	1 kV PASS	1 kV PASS	No disturbance of function
Tamper1 Cable	0.5 kV PASS	0.5 kV PASS	Equipment operated as intended.
	1 kV PASS	1 kV PASS	No disturbance of function
Tamper2 Cable	0.5 kV PASS	0.5 kV PASS	Equipment operated as intended.
	1 kV PASS	1 kV PASS	No disturbance of function

7.2.3 Conducted Disturbances, Induced by Electromagnetic Fields on Signal Lines

Result: **PASS**

The immunity against conducted disturbances, induced by electromagnetic fields on signal lines was tested according to EN 61000-4-6:2009.
The EUT was placed on a non-conductive board 0.1 m above the reference ground plane.

Applied voltage:	10 V
Frequency range:	0.15 MHz to 100 MHz
Modulation:	80% AM (1 kHz)
	Pulse 1 Hz (0.5 s ON: 0.5 s OFF)
Step size:	1%
Dwell time:	3 s
Mode of operation:	Mode ①
Required performance criterion:	Please refer to Appendix C

Date of testing:	September 18, 2013
Room temperature:	24℃
Relative humidity:	41%
Atmospheric pressure:	1016 hPa

7.2.3 Conducted Disturbances, Induced by Electromagnetic Fields on Signal Lines (Continued)

Table 6a: Conducted Disturbances, Induced by Electromagnetic Fields, Signal Lines
80% AM (1 kHz)

Line	Result	Remarks
Alarm1 Cable	10 V PASS	Equipment operated as intended. No disturbance of function.
Alarm2 Cable	10 V PASS	Equipment operated as intended. No disturbance of function.
Tamper1 Cable	10 V PASS	Equipment operated as intended. No disturbance of function.
Tamper2 Cable	10 V PASS	Equipment operated as intended. No disturbance of function.

Table 6b: Conducted Disturbances, Induced by Electromagnetic Fields, Signal Lines
Pulse 1 Hz (0.5 s ON: 0.5 s OFF)

Line	Result	Remarks
Alarm1 Cable	10 V PASS	Equipment operated as intended. No disturbance of function.
Alarm2 Cable	10 V PASS	Equipment operated as intended. No disturbance of function.
Tamper1 Cable	10 V PASS	Equipment operated as intended. No disturbance of function.
Tamper2 Cable	10 V PASS	Equipment operated as intended. No disturbance of function.

7.3 DC Power Lines

7.3.1 Fast Transient / Bursts on DC Power Lines

Result: **PASS**

The immunity against Fast Transient / Bursts on DC power lines was tested according to EN 61000-4-4:2012. The EUT was placed on a non-conductive board 0.1 m above the reference ground plane.

Test voltage:	1 kV
Polarity:	positive / negative
Repetition frequency:	100 kHz
Rise time of one pulse:	5 ns ±30%
Impulse duration (50% Value):	50 ns ±30%
Test duration:	1min.
Mode of operation:	Mode ①
Required performance criterion:	Please refer to Appendix C

Date of testing:	September 18, 2013
Room temperature:	24℃
Relative humidity:	43%
Atmospheric pressure:	1015 hPa

Table 7: Fast Transient / Bursts, DC Power Lines

Line (DC Input)	Result		Remarks
	Positive Polarity	Negative Polarity	
DC Power Cord (+)	1 kV PASS	1 kV PASS	Equipment operated as intended. No disturbance of function.
DC Power Cord (−)	1 kV PASS	1 kV PASS	Equipment operated as intended. No disturbance of function.
DC Power Cord (+), DC Power Cord (−)	1 kV PASS	1 kV PASS	Equipment operated as intended. No disturbance of function.

7.3.2 Slow High Energy Surge on DC Power Lines

Result: **PASS**

Slow high energy surge on DC power lines was tested according to EN 61000-4-5:2006.
The EUT was placed on a non-conductive board 0.1 m above the reference ground plane.

Test voltage:	0.5 kV / 1 kV line to ground
Wave shape, open circuit:	Front time 1.2 μs ±30% (Voltage)
	Time to half value 50 μs ±20% (Voltage)
Wave shape, short circuit:	Front time 8 μs ±20% (Current)
	Time to half value 20 μs ±20% (Current)
Polarity:	positive / negative
Number of surges:	5
Repetition rate:	1 min.
Mode of operation:	Mode ①
Required performance criterion:	Please refer to Appendix C

Date of testing:	September 20, 2013
Room temperature:	22℃
Relative humidity:	44%
Atmospheric pressure:	1015 hPa

Table 8: Slow High Energy Surge, DC Power Lines

Line (DC Input)	Result		Remarks
	Positive Polarity	Negative Polarity	
DC Power Cord (+)	0.5 kV PASS	0.5 kV PASS	Equipment operated as intended. No disturbance of function.
	1 kV PASS	1 kV PASS	
DC Power Cord (−)	0.5 kV PASS	0.5 kV PASS	Equipment operated as intended. No disturbance of function.
	1 kV PASS	1 kV PASS	

7.3.3 Conducted Disturbances, Induced by Electromagnetic Fields on DC Power Lines

Result: **PASS**

The immunity against conducted disturbances, induced by electromagnetic fields on DC power lines was tested according to EN 61000-4-6:2009.
The EUT was placed on a non-conductive board 0.1 m above the reference ground plane.

Applied voltage:	10 V
Frequency range:	0.15 MHz to 100 MHz
Modulation:	80% AM (1 kHz)
	Pulse 1 Hz (0.5 s ON: 0.5 s OFF)
Step size:	1%
Dwell time:	3 s
Mode of operation:	Mode ①
Required performance criterion:	Please refer to Appendix C

Date of testing:	September 18, 2013
Room temperature:	24℃
Relative humidity:	41%
Atmospheric pressure:	1016 hPa

Table 9a: Conducted Disturbances, Induced by Electromagnetic Fields, DC Power Lines
80% AM (1 kHz)

Line (DC Input)	Result	Remarks
DC Power Cord (+), DC Power Cord (−)	10 V PASS	Equipment operated as intended. No disturbance of function.

Table 9b: Conducted Disturbances, Induced by Electromagnetic Fields, DC Power Lines
Pulse 1 Hz (0.5 s ON: 0.5 s OFF)

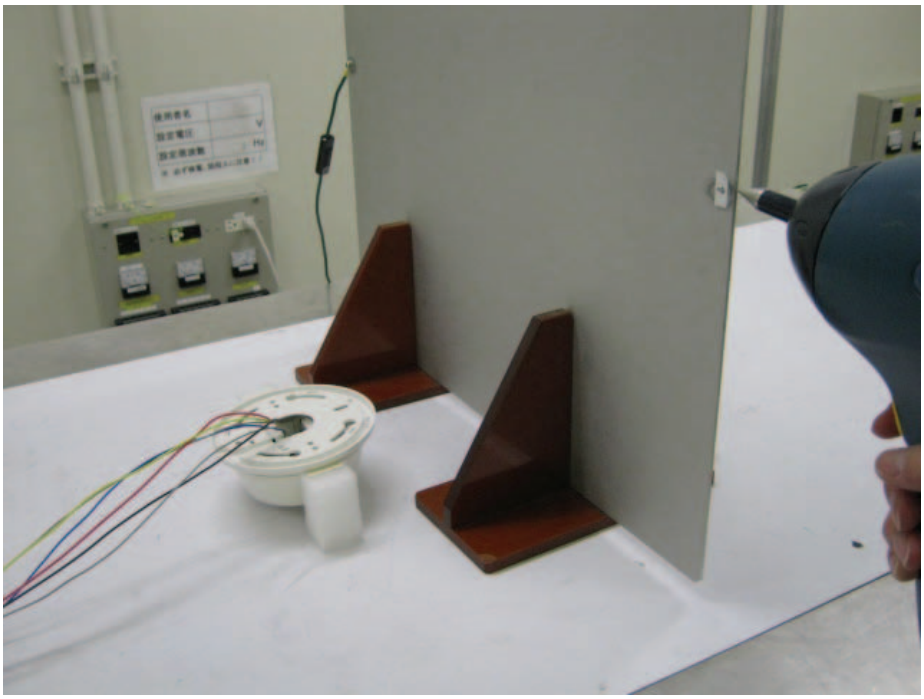
Line (DC Input)	Result	Remarks
DC Power Cord (+), DC Power Cord (−)	10 V PASS	Equipment operated as intended. No disturbance of function.

Appendix A: Photographs of the Test Setup

Radiated Emission (30 MHz to 1 GHz)

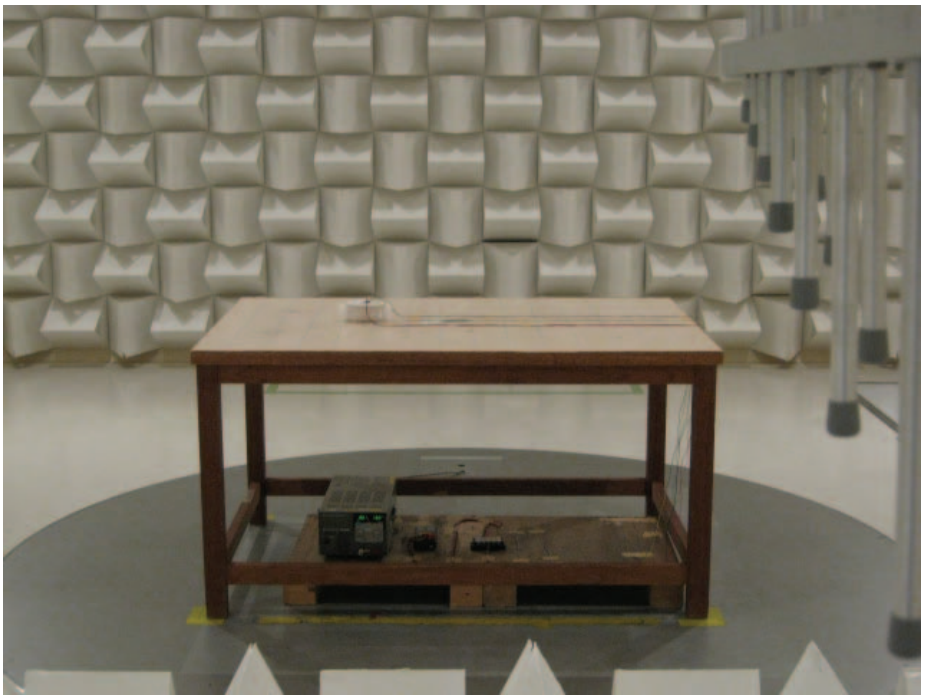
Appendix A: Photographs of the Test Setup (Continued)

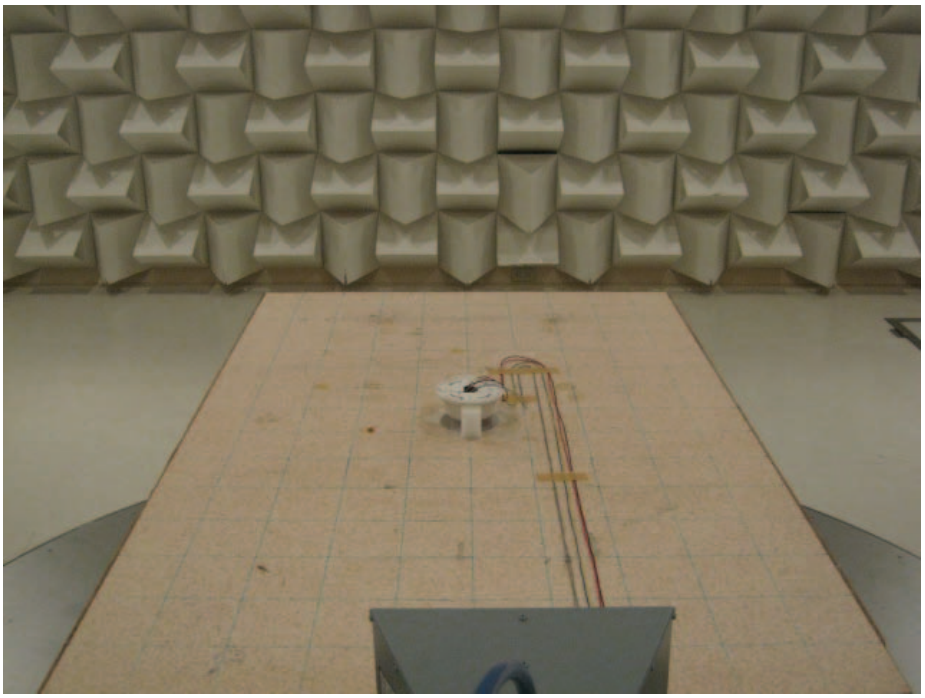
Electrostatic Discharge



Appendix A: Photographs of the Test Setup (Continued)

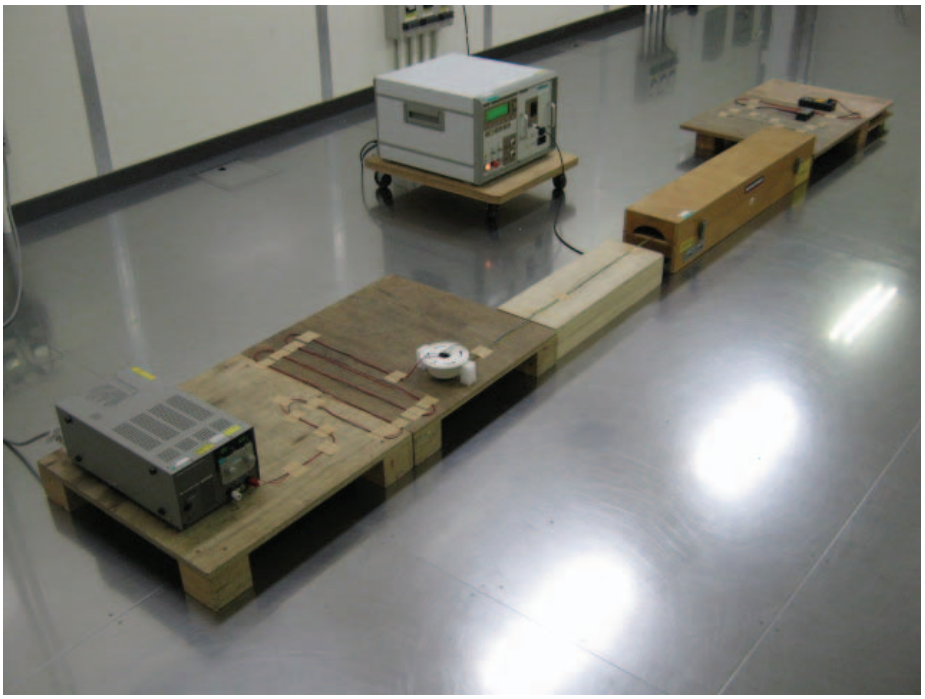
Radiated Electromagnetic Fields

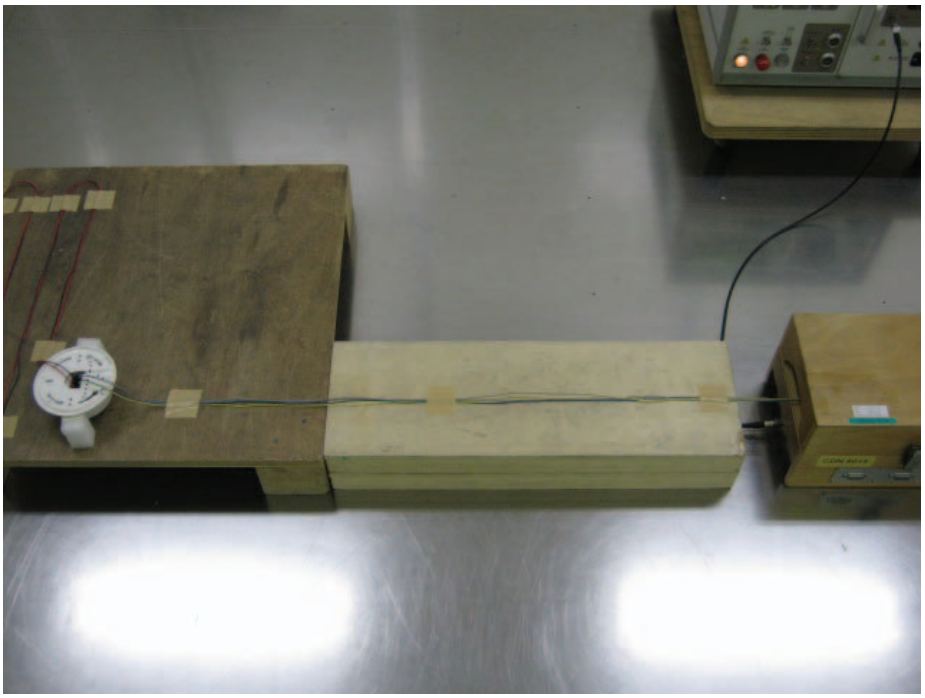




Appendix A: Photographs of the Test Setup (Continued)

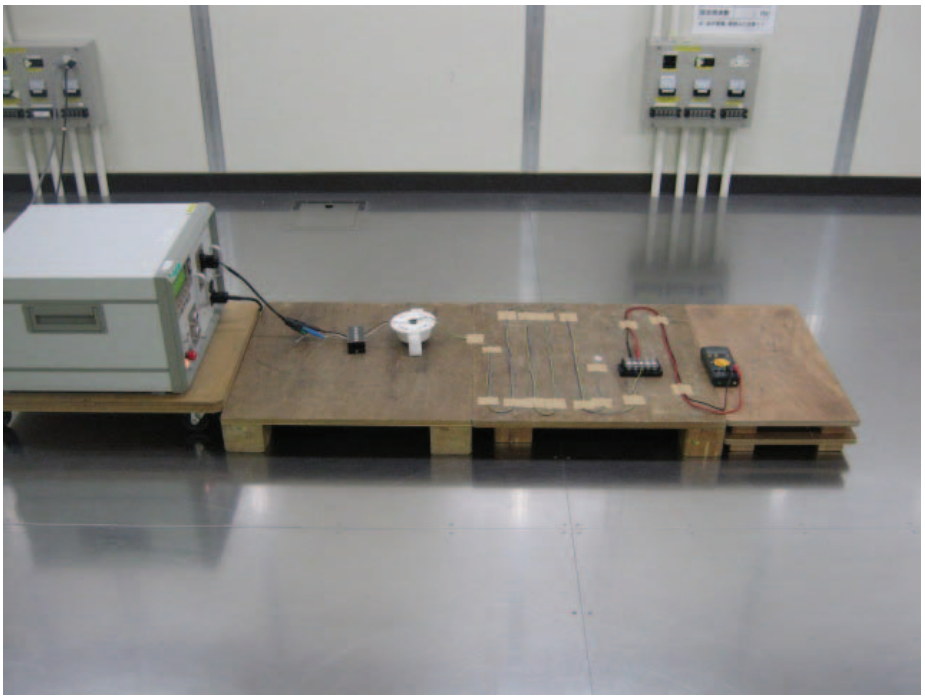
Fast Transient / Bursts, Signal Lines

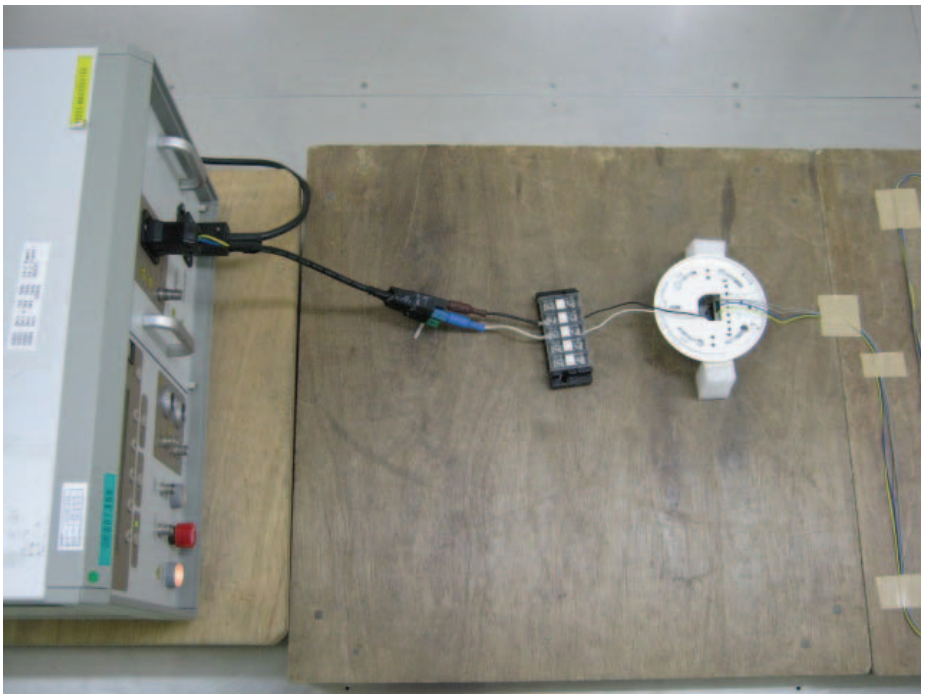




Appendix A: Photographs of the Test Setup (Continued)

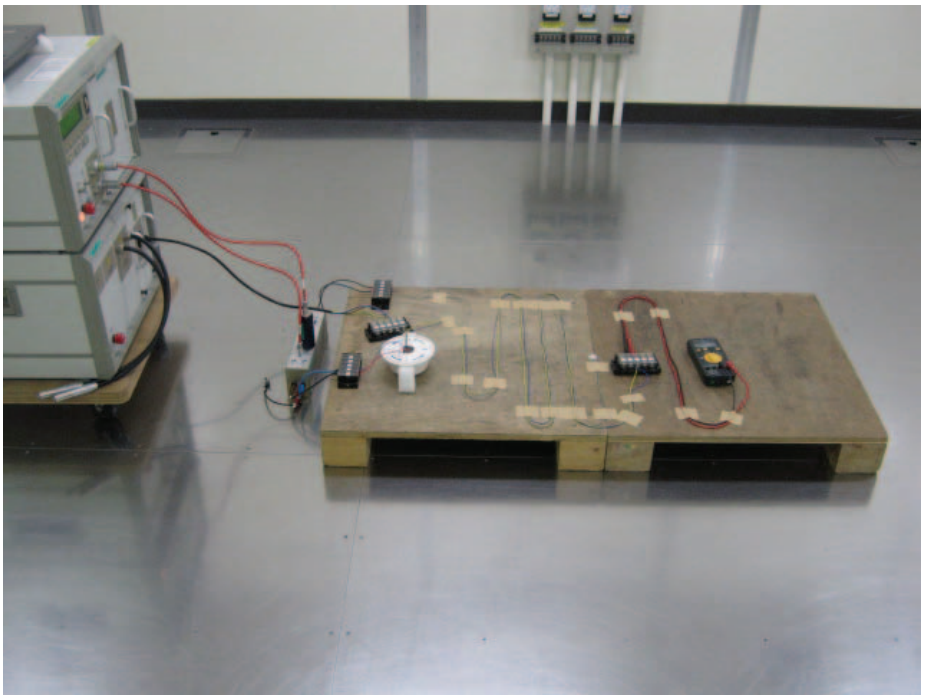
Fast Transient / Bursts, DC Power Lines

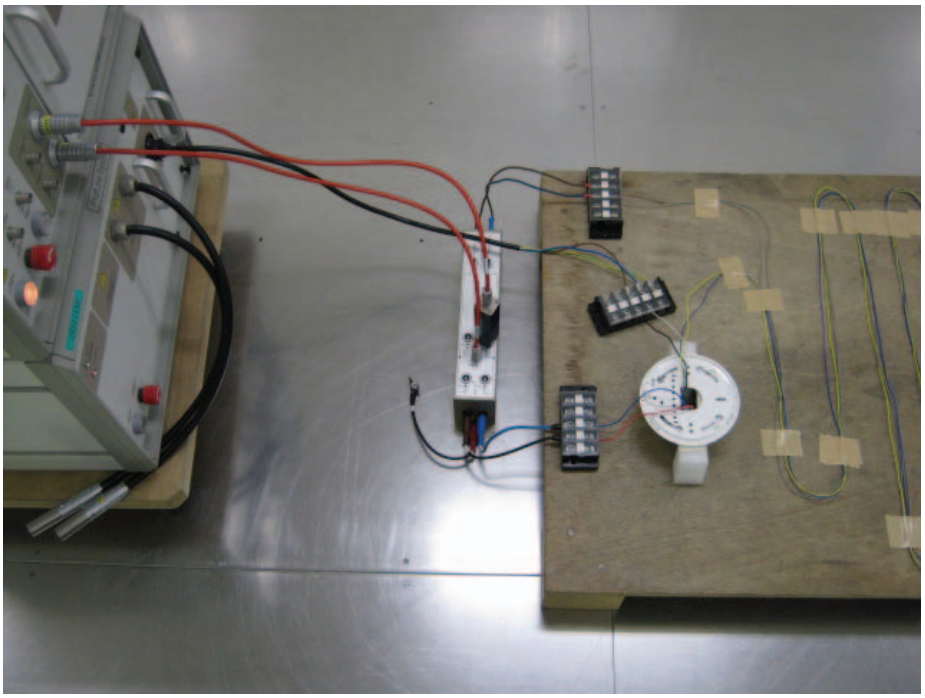




Appendix A: Photographs of the Test Setup (Continued)

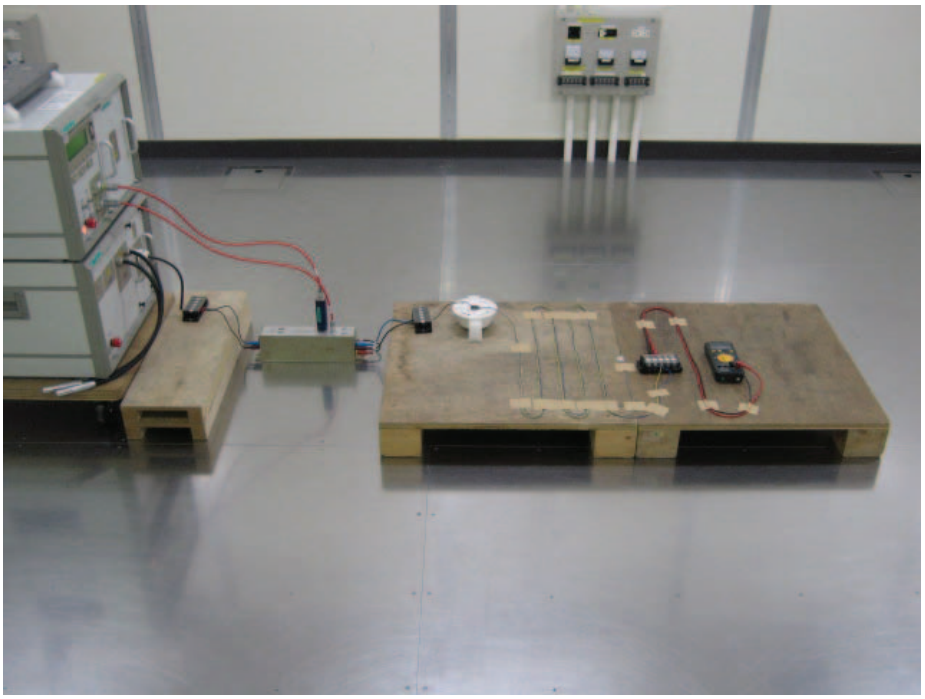
Slow High Energy Surge, Signal Lines

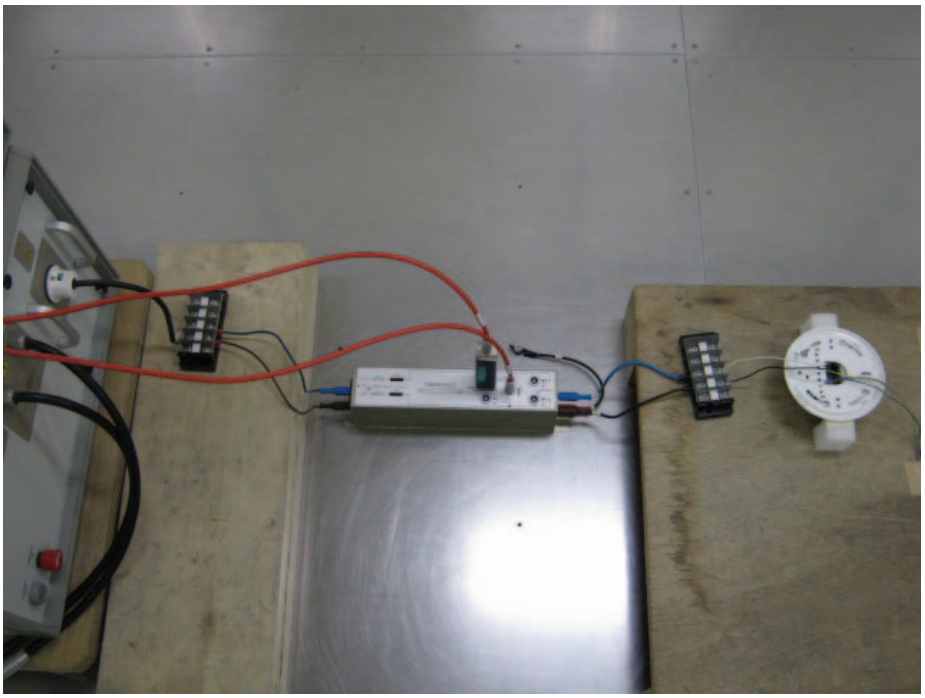




Appendix A: Photographs of the Test Setup (Continued)

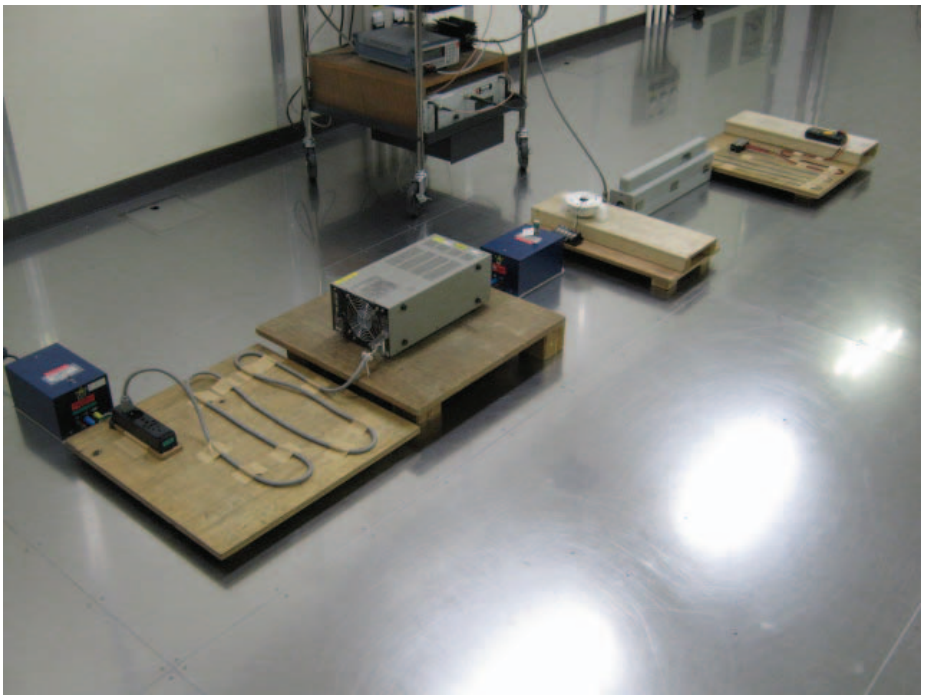
Slow High Energy Surge, DC Power Lines

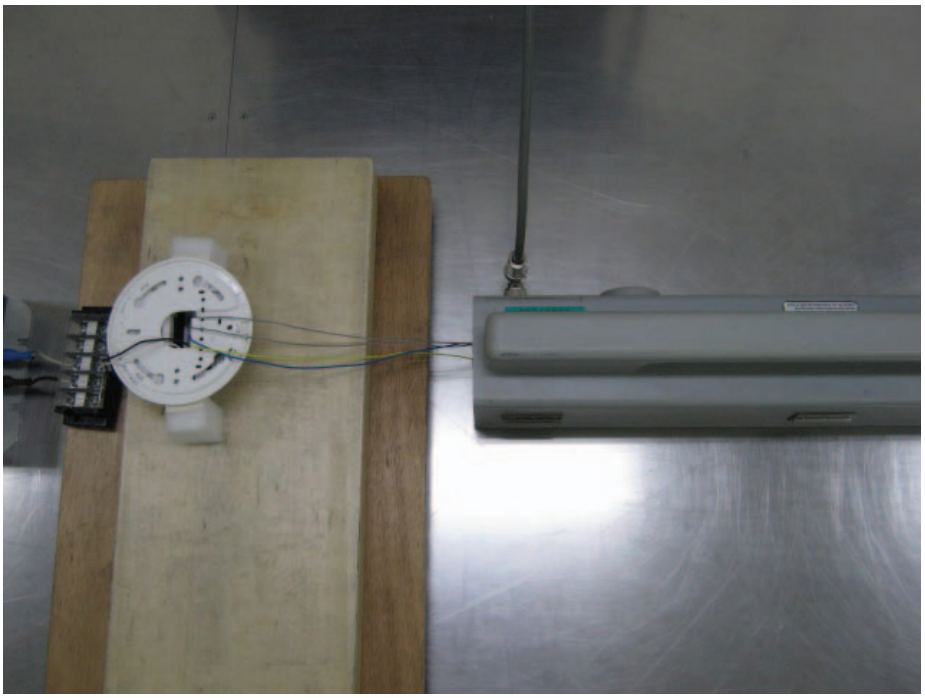




Appendix A: Photographs of the Test Setup (Continued)

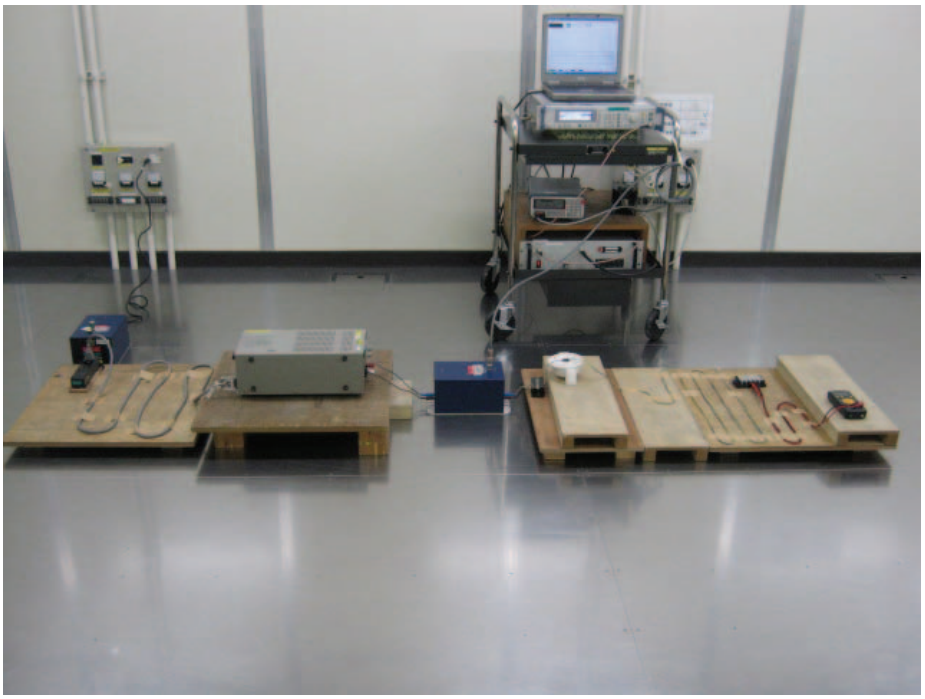
Conducted Disturbances, Induced by Electromagnetic Fields, Signal Lines

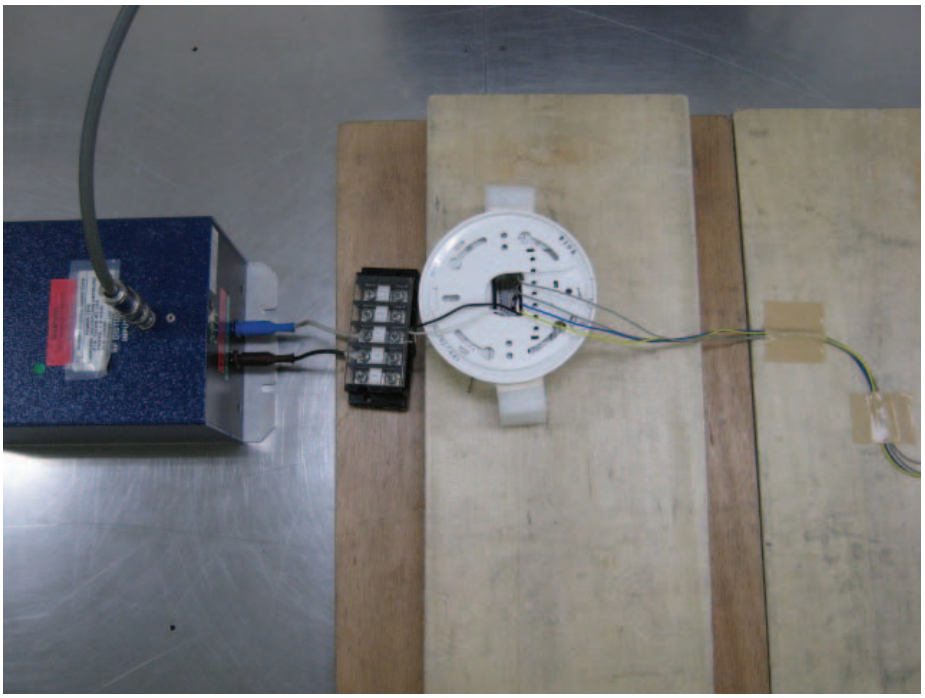




Appendix A: Photographs of the Test Setup (Continued)

Conducted Disturbances, Induced by Electromagnetic Fields, DC Power Lines





Appendix B: List of Test and Measurement Instruments

Radiated Emission

Instruments	Manufacturer	Model	Serial No.	Calibrated Date/Until
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100015	2012/11/03 2013/11/02
Pre-Amplifier	SONOMA	310N	274171	2013/03/15 2014/03/14
Biconical Antenna (30 MHz to 300 MHz)	SCHWARZBECK	VHBB9124	406	2013/09/07 2014/09/06
Log-periodic Antenna (300 MHz to 1 GHz)	SCHWARZBECK	UHALP9108-A	0818	2013/09/08 2014/09/07
OATS	Cosmos Corp.	Cosmos Corp. No.2	---	2013/02/21 2014/02/20
RF Cable (28)	SUHNER	RG214/U	C13 C15 C28	2013/06/24 2014/06/23
RF Cable (28)	Fujikura	12D-SFA	C14 C21	2013/06/24 2014/06/23
RF Cable (28)	SUHNER	141 PE	C16 C17 C18 C19	2013/06/24 2014/06/23
RF Selector	TOYO	NS4906N	0711-216	2013/06/24 2014/06/23

Appendix B: List of Test and Measurement Instruments (Continued)

Electrostatic Discharge

Instruments	Manufacturer	Model	Serial No.	Calibrated Date/Until
ESD Simulator System	SCHAFFNER	NSG438	343	2013/03/04 2014/03/03

Radiated Electromagnetic Fields

Instruments	Manufacturer	Model	Serial No.	Calibrated Date/Until
Logperiodic Antenna	SCHWARZBECK	VULP9118E	9118E772	Confirmed before Test
Horn Antenna	SCHWARZBECK	BBHA9120A	BBHA9120A387	Confirmed before Test
Power Amplifier	SCHAFFNER	CBA9433	43158	Confirmed before Test
Power Amplifier	SCHAFFNER	CBA9429	5009	Confirmed before Test
Power Meter /Diode Power Sensor	ROHDE & SCHWARZ	NRVD/NRV-Z4	101045 /100029 /100030	2013/09/12 2014/09/11
Signal Generator	ROHDE & SCHWARZ	SML-03	100328	2012/12/27 2013/12/26
RF Selector	TSJ	RFM-S2A2CIL	03151	2013/02/27 2014/02/26

Fast Transient / Bursts

Instruments	Manufacturer	Model	Serial No.	Calibrated Date/Until
Pulse Network Module	SCHAFFNER	PNW2225	200419-520LU	2013/06/06 2014/06/05
System Main Frame	SCHAFFNER	NSG2050	200430-512LU	2013/06/06 2014/06/05
Coupling Clamp	SCHAFFNER	CDN8015	19700	2013/06/06 2014/06/05

Appendix B: List of Test and Measurement Instruments (Continued)

Slow High Energy Surge

Instruments	Manufacturer	Model	Serial No.	Calibrated Date/Until
Pulse Network Module	SCHAFFNER	PNW2050	200427-538LU	2013/07/08 2014/07/07
System Main Frame	SCHAFFNER	NSG2050	386	2013/07/08 2014/07/07
Surge Pulse Coupling Network	SCHAFFNER	CDN131/133	530	2013/07/08 2014/07/07
Coupling Network	SCHAFFNER	CDN117	20218	Confirmed before Test

Conducted Disturbances, Induced by Electromagnetic Fields

Instruments	Manufacturer	Model	Serial No.	Calibrated Date/Until
Solid State Amplifier	Instruments for Industry	M75	N1048-1209	Confirmed before Test
Power Meter /100 V Insertion Unit 50 Ω	ROHDE & SCHWARZ	NRVS/URV5-Z4	101716/100513	2012/11/23 2013/11/22
Signal Generator	ROHDE & SCHWARZ	SML-03	100328	2012/12/27 2013/12/26
Coupling Decoupling Network (for EUT)	TSJ (FCC)	TSCDN-M2-16A	04038	2012/11/23 2013/11/22
Coupling Decoupling Network (for peripheral)	TSJ (FCC)	TSCDN-M3-16A	04060	2012/11/23 2013/11/22
Injection Clamp	TSJ (FCC)	TSIC-32	470	2012/11/23 2013/11/22

Appendix C: Immunity Criteria (Requirements of standard)

Electrostatic Discharge
Fast Transient / Bursts
Slow High Energy Surge

There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the application of the test is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.
The EUT shall meet the acceptance criteria for the functional test, after the conditioning.

Radiated Electromagnetic Fields

There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the conditioning is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change, and no such flickering of indicators occurs at a field strength of 3 V/m.
For components of CCTV systems, where the status is monitored by observing the TV picture, then deterioration of the picture is allowed at 10 V/m, providing.

a) there is no permanent damage or change to the EUT (e.g. no corruption of memory or changes to programmable settings etc.);
b) at 3 V/m, any deterioration of the picture is so minor that the system could still be used; and
c) there is no observable deterioration of the picture at 1 V/m

For components with radio links, it is accepted that communications via the radio link may not be possible during the conditioning within the transmitter and receiver exclusion bands defined in the relevant part of ETSI EN 301 489 for that type of radio link equipment. If no other part of ETSI EN 301 489 is applicable to the type of radio link equipment, then the definition of the exclusion bands shall be taken from ETSI EN 301 489-1. If the EUT is designed to detect and indicate this loss of communication, then this indication is permitted unless specifically prohibited in the EUT's product performance standard. If no performance standard has been published, then it shall be in accordance with the manufacturer's specification. It may be necessary to use appropriate filters to ensure that failures out of the exclusion bands are not due to harmonics generated by the test system.
The EUT shall meet the acceptance criteria for the functional test, after the conditioning.

Appendix C: Immunity Criteria (Requirements of standard) (Continued)

Conducted Disturbances, Induced by Electromagnetic Fields

There shall be no damage, malfunction or change of status due to the conditioning. Flickering of an indicator during the conditioning is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change, and no such flickering of indicators occurs at U_0= 130 dBµV.

For components of CCTV systems, where the status is monitored by observing the TV picture, then deterioration of the picture is allowed at U_0= 140 dBµV, providing.

d) there is no permanent damage or change to the EUT (e.g. no corruption of memory or changes to programmable settings etc.);
e) at U_0= 130 dBµV, any deterioration of the picture is so minor that the system could still be used; and
f) there is no observable deterioration of the picture at U_0= 120 dBµV

For components with radio links, it is accepted that communications via the radio link may not be possible during the conditioning within the transmitter and receiver exclusion bands defined in the relevant part of ETSI EN 301 489 for that type of radio link equipment. If no other part of ETSI EN 301 489 is applicable to the type of radio link equipment then the definition of the exclusion bands shall be taken from ETSI EN 301 489-1.

The EUT shall meet the acceptance criteria for the functional test, after the conditioning.

The manufacturer has added the following performance criteria.

- During the test, alarm operations (alarm output, voice message sounding and LED flickering) shall not be performed.
  After the test, alarm operations shall be performed normally in response to ultraviolet light (fire etc.).

Appendix D: Emission Test Data

Calculation

Result = Reading + c.f.

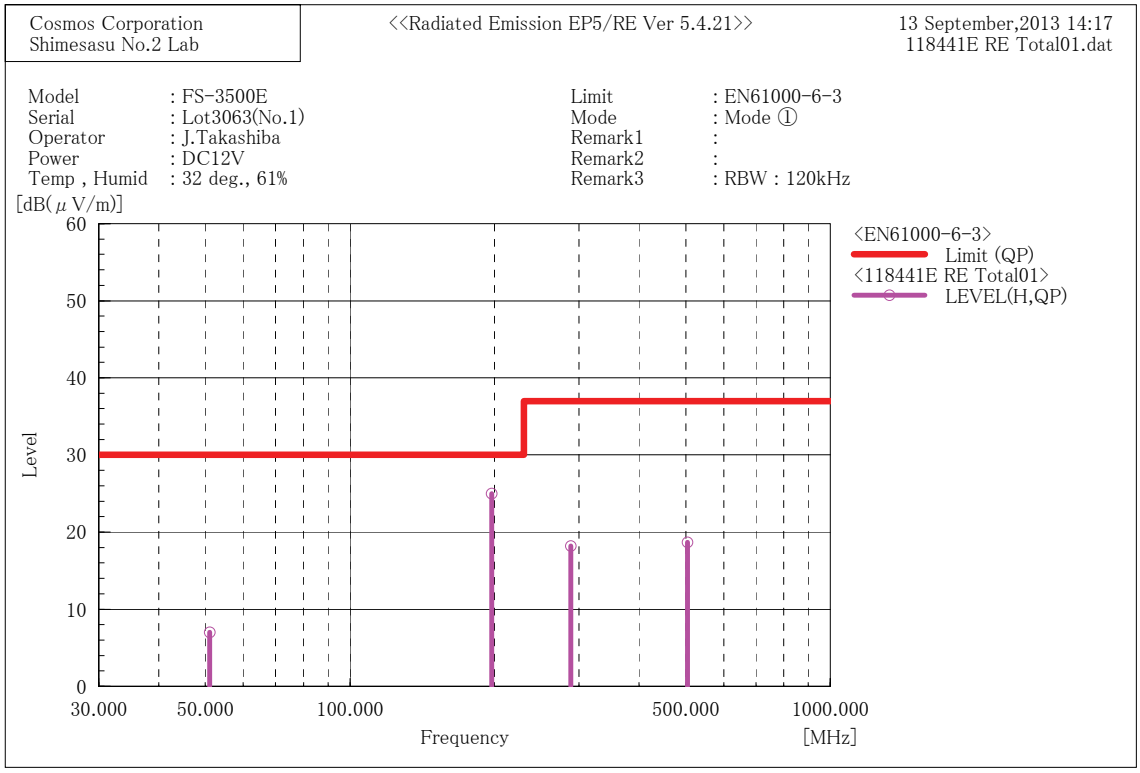
Margin = Limit - Result

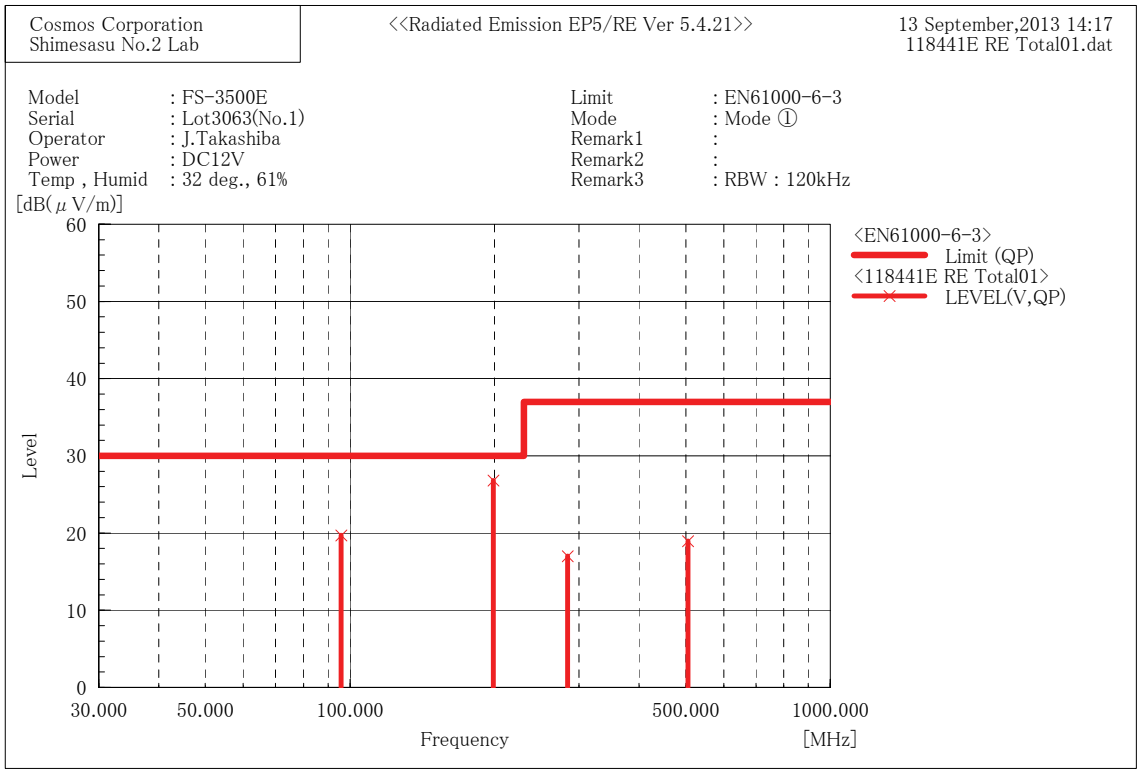
Radiated Emission (30 MHz to 1 GHz)

```
************************************  Cosmos Corporation  ************************************
                              <<Radiated Emission EP5/RE Ver 5.4.21>>    13 September,2013 14:17
                                                                          118441E RE Total01.dat

Limit             : EN61000-6-3
Model             : FS-3500E
Serial            : Lot3063(No.1)
Operator          : J.Takashiba
Power             : DC12V
Temp , Humid      : 32 deg., 61%
Mode              : Mode ①
Remark1           :
Remark2           :
Remark3           : RBW : 120kHz
************************************************************************************************
Final Result

--- Horizontal Polarization (QP)---
No.   Frequency   Reading     c.f      Result      Limit     Margin  Height   Angle
        [MHz]    [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]    [cm]    [° ]
  1     51.033     24.0     -17.0        7.0        30.0      23.0    390.0   278.0
  2    197.385     36.3     -11.3       25.0        30.0       5.0    261.1   233.0
  3    288.375     24.7      -6.5       18.2        37.0      18.8    390.0   292.0
  4    503.863     23.9      -5.2       18.7        37.0      18.3    397.0     5.0

--- Vertical Polarization (QP)---
No.   Frequency   Reading     c.f      Result      Limit     Margin  Height   Angle
        [MHz]    [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]    [cm]    [° ]
  1     95.928     37.2     -17.5       19.7        30.0      10.3    104.0   146.0
  2    198.874     38.0     -11.2       26.8        30.0       3.2    102.0    63.0
  3    283.780     23.7      -6.7       17.0        37.0      20.0    104.0   241.0
  4    505.530     24.2      -5.2       19.0        37.0      18.0    103.0   357.0
```

Appendix D: Emission Test Data (Continued)

Radiated Emission (30 MHz to 1 GHz)





Appendix E: Photographs of Modification

[Details of Modification]
During the test of EN 61000-4-2, the wire mesh was attached to the aperture part of the detector element of the EUT. (○)