

EMC Test Report

Test Report Number T-1559897-02
Applied Standard(s) FCC 47 CFR Part15 Subpart B
Date of Issue 24 August, 2015
Testing Laboratory Address e-OHTAMA, LTD. Tokyo Laboratory
2-8-20 Kurigi, Asao-ku, Kawasaki-shi, Kanagawa, 215-0033 JAPAN
Test Date(s) 24 July, 2015
Product Name CMOS Area Scan Color Camera
Model Number GO-2400C-PGE
Serial Number β2 0001
Applicant (Client) Address JAI Ltd., Japan
Portside Dia Building 10-35 Sakae-Chou, Kanagawa-ku
Yokohama, 221-0052 Japan
Manufacturer Address JAI Ltd., Japan
Portside Dia Building 10-35 Sakae-Chou, Kanagawa-ku
Yokohama, 221-0052 Japan

Test Result

The test result for the electromagnetic compatibility tests as described in the section 1 to 2 and in this page was:

Pass

Approved by: _____


Hidekazu Taguchi
Center Manager



Checked box () indicates that the listed condition, standard or equipment is applicable for this Report.
Blank box () indicates that the listed condition, standard or equipment is not applicable for this Report.
It is not allowed to copy this report, except in full, without written permission of the test laboratory.
Test results of this report refer only to the EUT tested here.

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1. Summary

1.1 Terms and definitions

AV
Average

DoC
Declaration of Conformity

L
Live (Phase)

N
Neutral (Phase)

PK
Peak

QP
Quasi-peak

1.2 Standard(s) and Result

Applied Standard(s)	Normative Reference(s)	Classification	Result
FCC 47 CFR Part15 Subpart B	<input checked="" type="checkbox"/> ANSI C63.4:2003	Class B digital devices	Pass

1.3 Deviations from Standard(s)

There was no deviation from the standard.

2. Equipment Under Test (EUT)

2.1 General Descriptions

CMOS Color Area Scan Camera

2.2 Detailed Descriptions

Product Name	CMOS Area Scan Color Camera
Model Number	GO-2400C-PGE
Serial Number	β2 0001
Power Supply	48 V dc
Dimension	29 mm (W) x 29 mm (H) x 41.5 mm (D) (excluding lens mount)
Highest Operating Frequency	250 MHz
Normal Placement	Table-top
Condition of the EUT	Trial product on production line

2.3 Modification to the EUT

There was no modification or measure.

2.4 Operation Mode(s) of the EUT for EMC during the Test(s)

Operation Mode Nam	Description
Continues Mode	Acquisition Mode - Continues

2.5 EUT, Peripheral Devices and Interconnecting Cables

The following devices and cables were used during the test:

2.5.1 EUT

Mark	Description	Model Number	Serial Number	FCC ID Code or DoC status	Manufacturer
EUT	CMOS Area Scan Color Camera	GO-2400C-PGE	β2 0001	Doc	JAI Ltd., Japan

2.5.2 Peripheral Devices

Mark	Description	Model Number	Serial Number	FCC ID Code or DoC status	Manufacturer
A	Gigabit Ethernet I/F	Intel(R) 82580	5120023087	DoC	AVAL DATA
B	Personal Computer	Precision Tower 5810	5RCPB22	DoC	DELL
C	LCD Monitor	E2009Wt	0X553D	DoC	DELL
D	Lens	None	038119	N/A	RICOH
E	Keyboard	KB212-B	0DH939	DoC	DELL
F	Mouse	N231	None	DoC	DELL

2.5.3 Interconnecting Cables

Mark	Description	Length (m)	Shielded		Tested Port(s) (Note:1)		Identification (Conductors)
			Cable	Connector	Applicable	Interface	
1	AC Power Cable for LCD Monitor	1.5	None	None	No	-	-
2	AC Power Cable for Personal Computer	1.5	None	None	Yes	AC Power	-
3	DVI Cable	1.7	Yes	Yes	No	-	-
4	Keyboard cable	2.1	Yes	Yes	No	-	-
5	Mouse cable	1.8	Yes	Yes	No	-	-
6	LAN Cable (CAT-6)	10	Yes	Yes	No	-	-

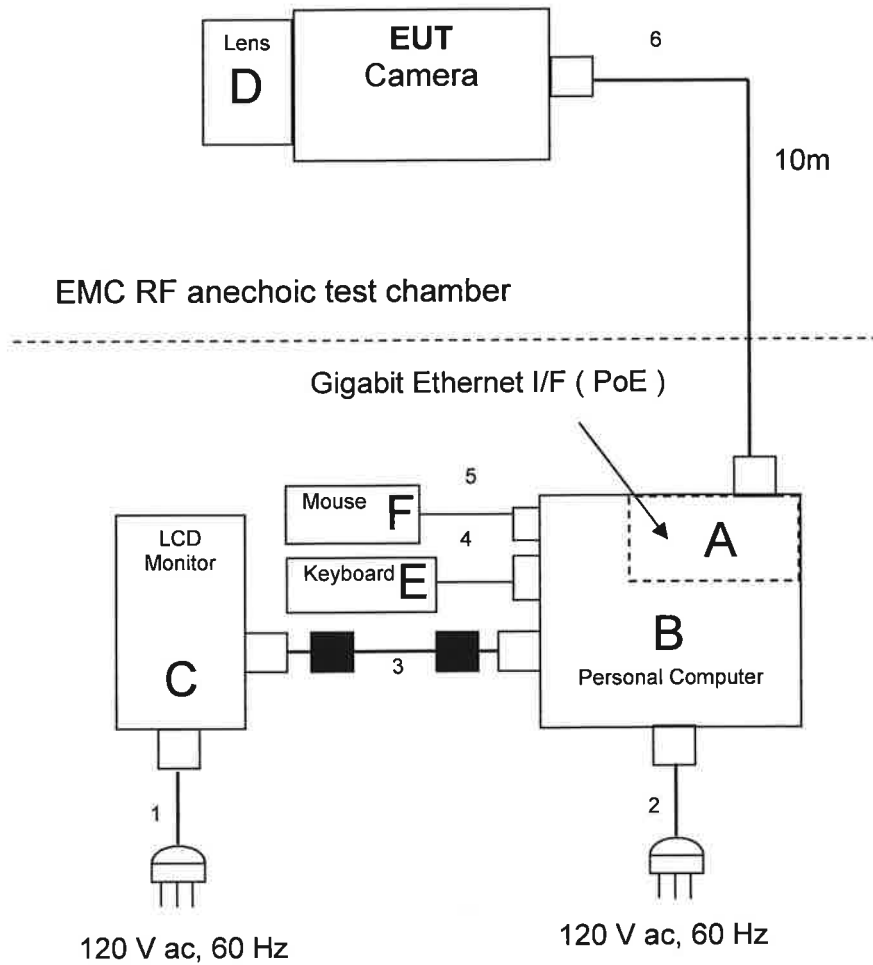
Note:1 Tested port(s) required for applicable standard(s).

Note:2 EUT Power 48 V dc was supplied from POE.

2.6 System Configuration

Unless otherwise specified in the following sections, the test configuration described here is applied for the tests.

The configuration was chosen by the applicant.



3. Test Data

3.1 Conducted Emissions (Mains)

3.1.1 Test specification

Standard	FCC 47 CFR Part 15 Subpart B
Class of Equipment	Class B digital devices
Frequency Range	0.15 MHz to 30 MHz
Test Date	24 July, 2015
Test Location	Tokyo Laboratory No.1 EMC test room
Test Engineer	Kazuhiro Nomura
Temperature	28 °C
Humidity	56 % RH
Pressure	999 hPa
Power Supply	48 V dc
Operation Mode Name	Continues Mode

3.1.1.1 Test Result

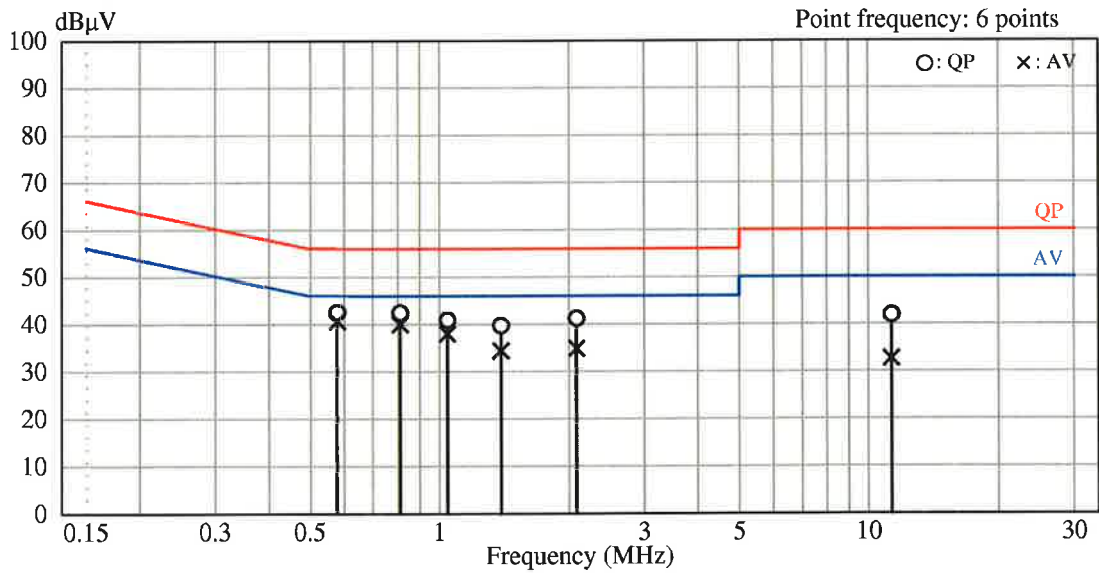
Pass

3.1.1.2 Test Detail

Tested Port	Minimum limit margin
AC Power Cable for Personal Computer (Mark 2)	5.3 dB at 0.5789 MHz (AV)

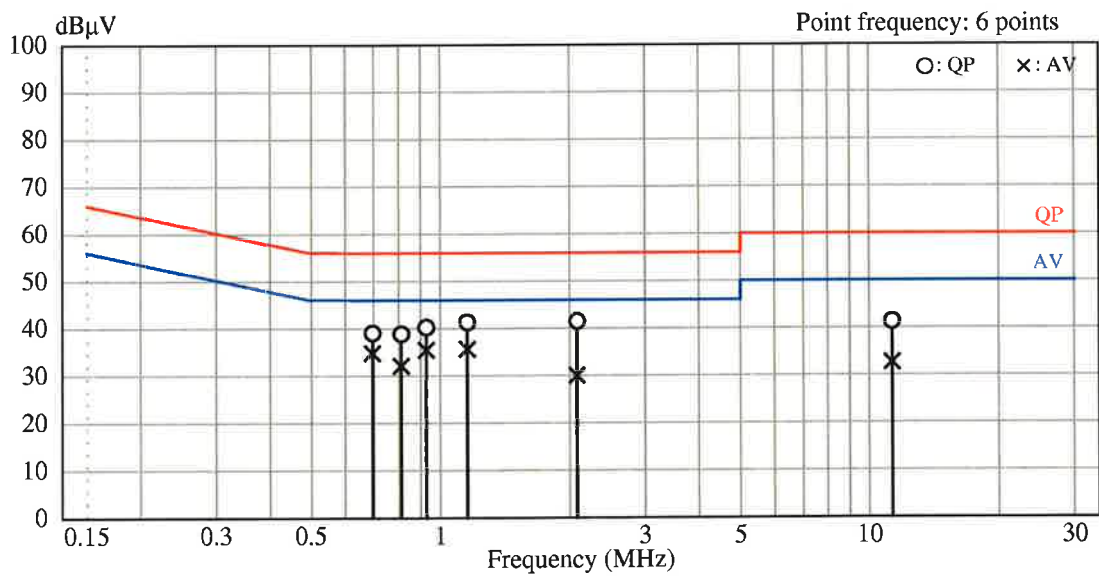
3.1.1.3 Continues Mode (L)

Frequency (MHz)	Reading (dB μ V)		Correction factor (dB)	Noise level (dB μ V)		Limit (dB μ V)		Margin (dB)	
	QP	AV		QP	AV	QP	AV	QP	AV
0.5789	31.8	29.9	10.8	42.6	40.7	56.0	46.0	13.4	5.3
0.8112	31.8	29.3	10.7	42.5	40.0	56.0	46.0	13.5	6.0
1.0443	30.4	27.4	10.6	41.0	38.0	56.0	46.0	15.0	8.0
1.3911	29.2	23.8	10.6	39.8	34.4	56.0	46.0	16.2	11.6
2.0863	30.7	24.3	10.6	41.3	34.9	56.0	46.0	14.7	11.1
11.2898	30.8	21.5	11.2	42.0	32.7	60.0	50.0	18.0	17.3

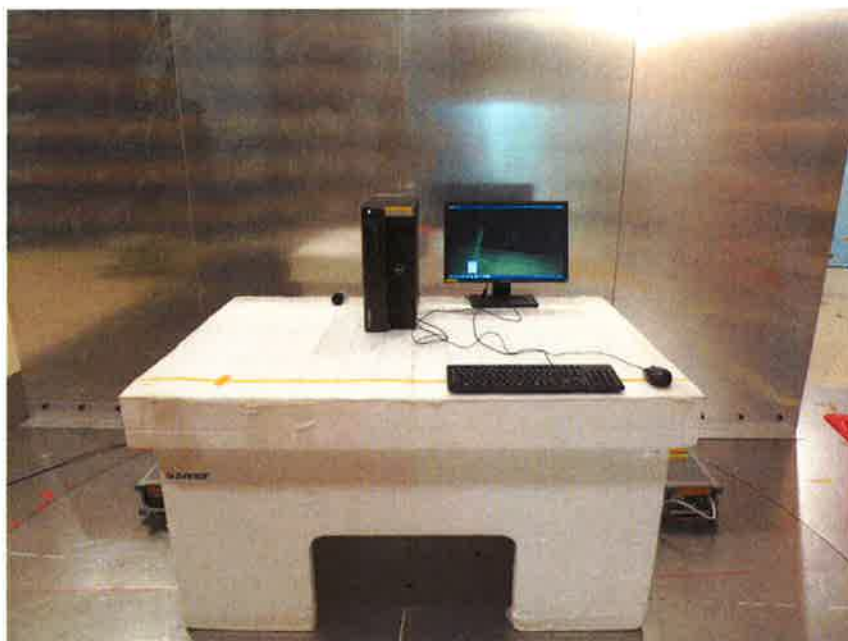


3.1.1.4 Continues Mode (N)

Frequency (MHz)	Reading (dB μ V)		Correction factor (dB)	Noise level (dB μ V)		Limit (dB μ V)		Margin (dB)	
	QP	AV		QP	AV	QP	AV	QP	AV
0.6954	28.4	24.1	10.7	39.1	34.8	56.0	46.0	16.9	11.2
0.8114	28.2	21.4	10.7	38.9	32.1	56.0	46.0	17.1	13.9
0.9272	29.7	24.9	10.6	40.3	35.5	56.0	46.0	15.7	10.5
1.1568	30.7	25.0	10.6	41.3	35.6	56.0	46.0	14.7	10.4
2.0867	30.9	19.4	10.6	41.5	30.0	56.0	46.0	14.5	16.0
11.2865	30.1	21.5	11.2	41.3	32.7	60.0	50.0	18.7	17.3



3.1.2 Test Setup Photographs (EUT)



3.2 Radiated Electric-Field Emissions

3.2.1 Test Specification

Standard	FCC 47 CFR Part 15 Subpart B
Class of Equipment	Class B digital devices
Test Distance	3m
Frequency Range	30 MHz to 1 000 MHz
Test Date	24 July, 2015
Test Location	Tokyo Laboratory No.1 EMC test room
Test Engineer	Kazuhiro Nomura
Temperature	28 °C
Humidity	56 % RH
Pressure	999 hPa
Power Supply	48 V dc
Operation Mode Name	Continues Mode

3.2.1.1 Test Result

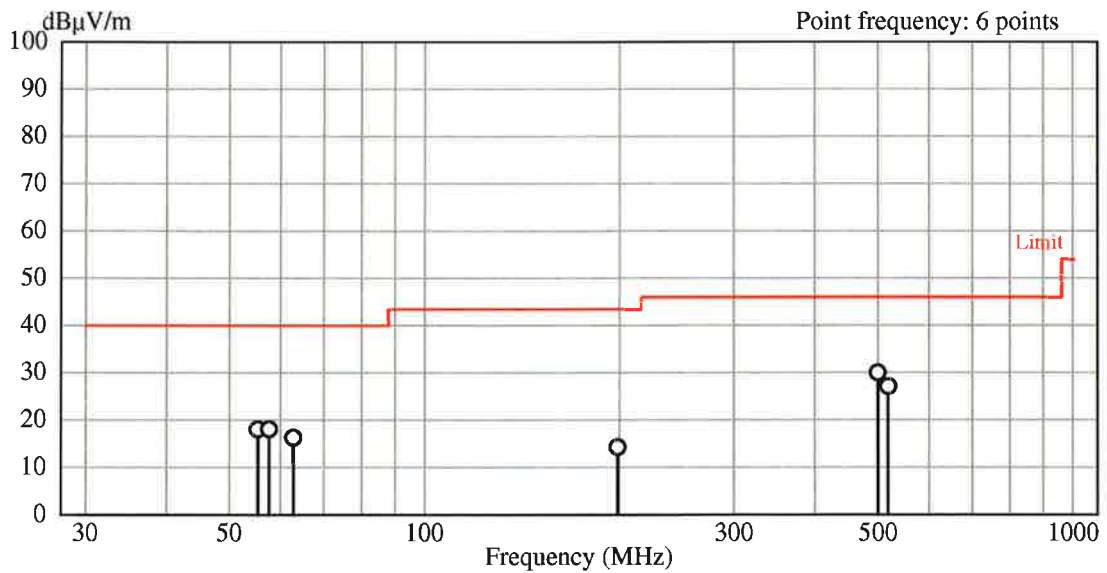
Pass

3.2.1.2 Test Detail

Minimum limit margin
7.4 dB at 57.56 MHz

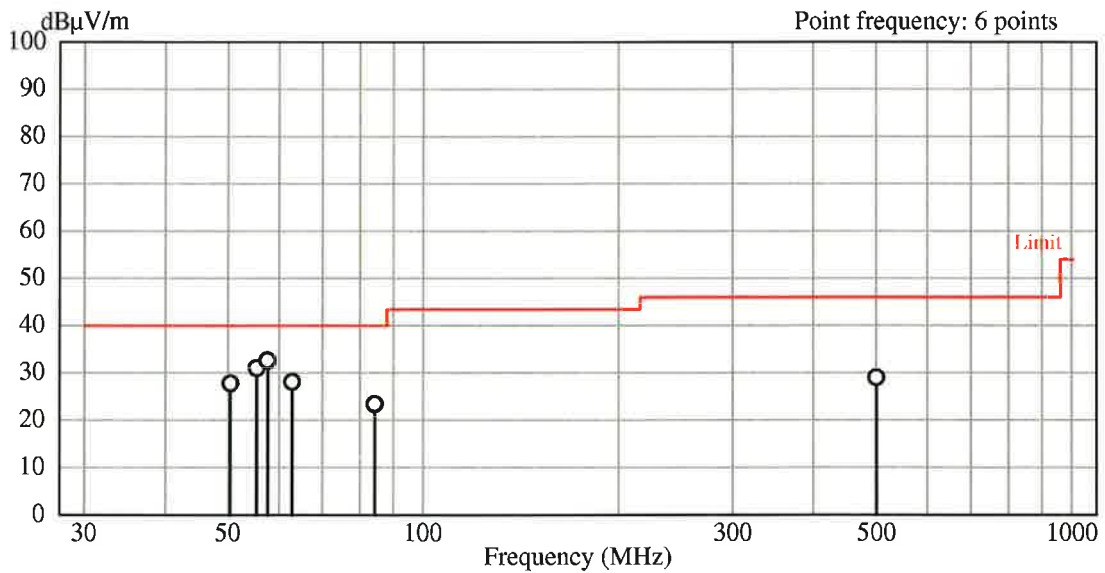
3.2.1.3 Continues Mode, Below 1 000 MHz (3 m), Horizontal

Frequency (MHz)	Reading (dB μ V)	Correction factor (dB/m)	Noise level (dB μ V/m)	Antenna height (m)	Turn table angle (°)	Limit (dB μ V/m)	Margin (dB)
55.33	24.4	-6.3	18.1	1.0	122	40.0	21.9
57.57	24.5	-6.4	18.1	1.0	91	40.0	21.9
62.82	23.3	-7.0	16.3	1.0	104	40.0	23.7
198.67	22.4	-8.1	14.3	1.0	275	43.5	29.2
500.00	30.2	-0.2	30.0	1.0	257	46.0	16.0
518.60	26.9	0.2	27.1	1.0	91	46.0	18.9



3.2.1.4 Continues Mode, Below 1 000 MHz (3 m), Vertical

Frequency (MHz)	Reading (dB μ V)	Correction factor (dB/m)	Noise level (dB μ V/m)	Antenna height (m)	Turn table angle (°)	Limit (dB μ V/m)	Margin (dB)
50.42	33.9	-6.1	27.8	1.0	162	40.0	12.2
55.35	37.3	-6.3	31.0	1.0	203	40.0	9.0
57.56	39.0	-6.4	32.6	1.0	221	40.0	7.4
62.82	35.1	-7.0	28.1	1.0	153	40.0	11.9
84.30	34.4	-11.0	23.4	1.0	205	40.0	16.6
500.00	29.2	-0.2	29.0	1.0	218	46.0	17.0



3.2.2 Test Specification

Standard	FCC 47 CFR Part 15 Subpart B
Class of Equipment	Class B digital devices
Test Distance	3m
Frequency Range	1 000 MHz to 2 000 MHz
Test Date	24 July, 2015
Test Location	Tokyo Laboratory No.1 EMC test room
Test Engineer	Kazuhiro Nomura
Temperature	28 °C
Humidity	56 % RH
Pressure	999 hPa
Power Supply	48 V dc
Operation Mode Name	Continues Mode

3.2.2.1 Test Result

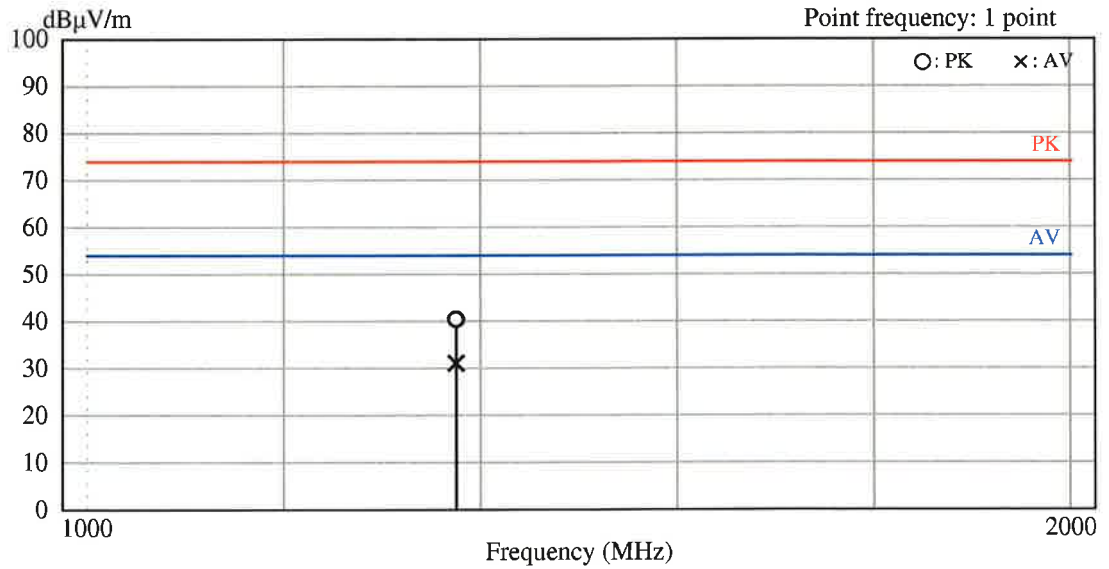
Pass

3.2.2.2 Test Detail

Minimum limit margin
17.9 dB at 1375.00 MHz (AV)

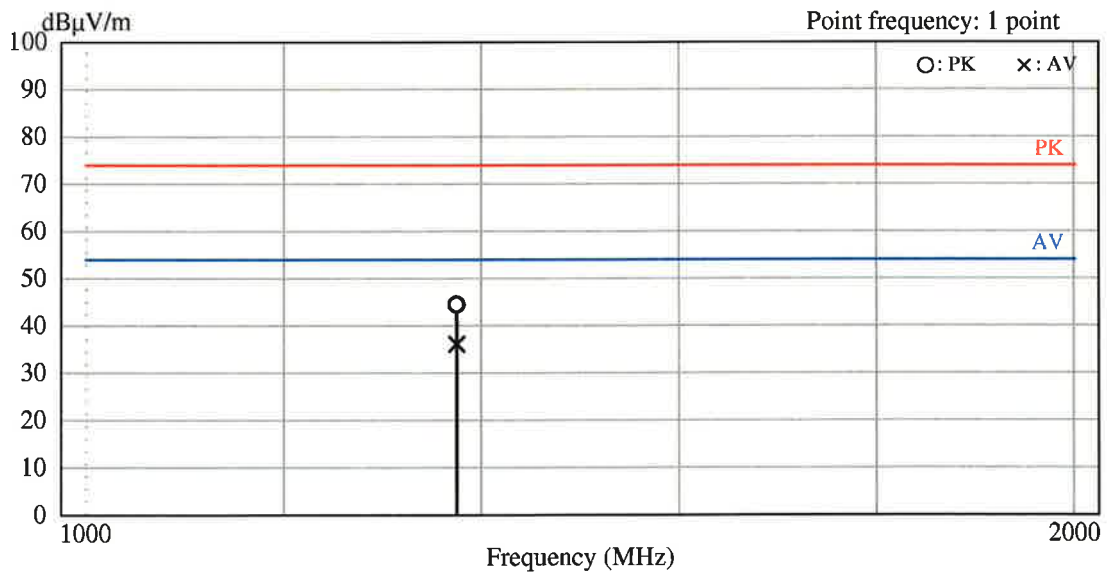
3.2.2.3 Continues Mode, Above 1 000 MHz (3 m), Horizontal

Frequency (MHz)	Reading (dB μ V)	Correction factor (dB/m)	Noise level (dB μ V/m)	Antenna height (m)	Turn table angle (°)	Limit (dB μ V/m)	Margin (dB)	
1375.00	49.0	-8.5	40.5	2.0	228	74.0	33.5	PK
1375.00	40.2	-9.1	31.1	2.0	228	54.0	22.9	AV

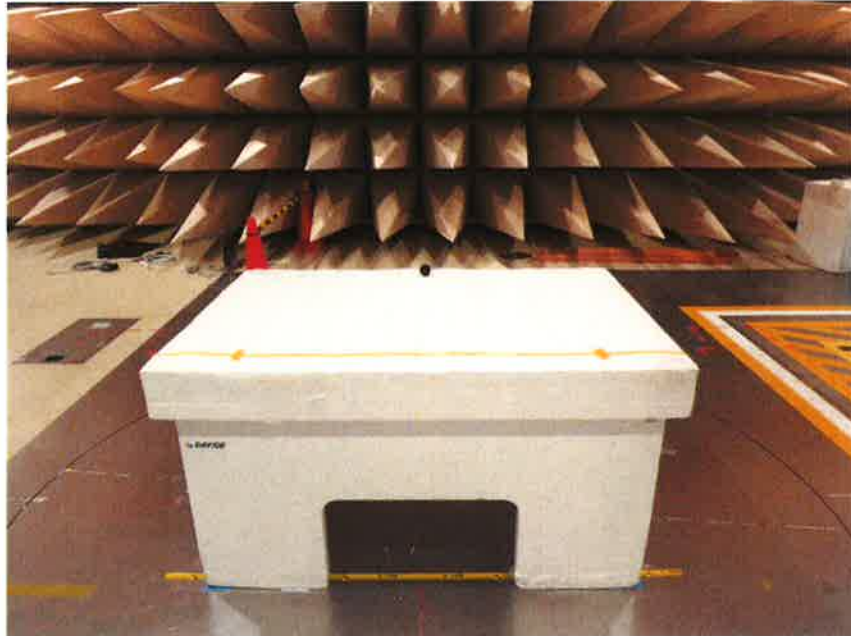


3.2.2.4 Continues Mode, Above 1 000 MHz (3 m), Vertical

Frequency (MHz)	Reading (dB μ V)	Correction factor (dB/m)	Noise level (dB μ V/m)	Antenna height (m)	Turn table angle (°)	Limit (dB μ V/m)	Margin (dB)	
1375.00	53.1	-8.5	44.6	1.0	287	74.0	29.4	PK
1375.00	44.6	-8.5	36.1	1.0	287	54.0	17.9	AV



3.2.3 Test Setup Photographs (EUT)



3.2.4 Test Setup Photographs (Peripheral)



4. Test facility

4.1 Test Instruments

4.1.1 Conducted Emissions

Product Name	Manufacturer	Model Number	Serial Number	Calibration Date	Due Date
Spectrum Analyzer	Rohde&Schwarz	FSEB30	833999/020	2014/11/26	2015/11/30
Receiver	Rohde&Schwarz	ESU26	100218	2014/7/3	2015/7/30
LISN	Rohde&Schwarz	ENV216	100169	2015/7/15	2016/7/31
LISN	Rohde&Schwarz	ENV216/12	101535	2014/7/22	2015/7/31
Sheath current suppressor	e-OHTAMA	None	No.1	2014/11/26	2015/11/30
RF Relay Matrix Unit	TSJ	REM-E821-432 (No1 RF Switch System)	04416	2015/3/14	2016/3/31
50Ω Terminator	TAMAGAWA	CT-01	14	2014/12/12	2015/12/31
Soft Ware	e-OHTAMA	emission measurement program	toemc02-1.4	N/A	N/A

4.1.2 Radiated Electric-Field Emissions

Product Name	Manufacturer	Model Number	Serial Number	Calibration Date	Due Date
Spectrum Analyzer	Rohde&Schwarz	FSEB30	833463/014	2015/7/6	2016/7/31
Receiver	Rohde&Schwarz	ESVS30	842807/010	2015/6/30	2016/6/30
Receiver	Rohde&Schwarz	ESU26	100218	2014/7/3	2015/7/30
Pre-Amplifier	Hewlett Packard	8447D	2944A07182	2015/3/14	2016/3/31
Pre-Amplifier	Hewlett Packard	8449B	3008A0079	2014/7/24	2015/7/31
Attenuator (6 dB)	Suhner	6806.17.B	1	2015/3/14	2016/3/31
Horn Antenna	ETS LINDGREN	3115	6554	2014/12/5	2015/12/31
Trilog Antenna	Schwarzbeck	VULB9160	9160-3189	2014/9/8	2015/9/30
RF Relay Matrix Unit	TSJ	REM-E821-432 (No1 RF Switch System)	04416	2015/3/14	2016/3/31
Soft Ware	e-OHTAMA	emission measurement program	toemc02-1.4	N/A	N/A

4.2 Test equipment

Dimension	Material	Measurement
1.8m (W) X 0.8m (H) X 0.9m (D)	polystyrene	Conducted Emissions and Radiated Electric-Field Emissions

4.3 Normalized Site Attenuation

Site Name	Laboratory	Calibration Date	Due Date
Semi-Anechoic chamber No.1	Tokyo Laboratory	2014/10/01	2015/10/31

Annex A (Miscellaneous Information)

A.1 Test Locations

Unless otherwise described in this report, the tests were carried out at the following locations:

e-OHTAMA, LTD. Tokyo Laboratory
2-8-20 Kurigi, Asao-ku, Kawasaki-shi, Kanagawa, 215-0033 JAPAN
TEL: +81-44-980-2090
FAX: +81-44-980-2052

VLAC Accreditation No.: VLAC-018-1
VCCI Registration No.: A-0021

A.2 Uncertainty

Emissions

Measurement	Uncertainty ($k = 2$)
	U_{lab}
RF Conducted Emissions (150kHz-30MHz)	
AMN	3.5dB
Current probe	3.6dB
Radiated Electromagnetic Field	
30-1000MHz	5.0dB
1-18GHz	5.3dB

Tests not listed above

Uncertainty for other tests which are reported in this test report, if any, would be available on request.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Annex B (Description of Test Method)

Unless otherwise described in this report, tests are carried out using the methods which are described in the applied standards and summarized in this section.

Specifically for 47 CFR 15 Subpart B, section 6 of ANSI C63.4-2003 is to be used for EUT arrangements and operations, and section 8 of the standard is to be used for radiated emissions measurement procedures.

B.1 Conducted Emissions (AC Main and Other Terminals)

Table-top EUT is placed on a wooden table so that one side (rear or bottom) of the EUT is separated 0.4 m from the reference plane (metallic wall or ground plane), and floor-standing EUT is placed on the ground plane.

Mains to the EUT is supplied through a LISN, and mains to non-EUT components, if any, are supplied through yet another LISN(s).

If LISN is not applicable, mains would be supplied directly and a voltage probe would be used instead for the measurement.

For each current-carrying conductors or terminals to be measured, a spectrum analyzer is used to pre-scan the emissions.

For each of the significant emissions detected, the maximum signal level is read using a measuring receiver having CISPR 16 quasi-peak (QP) and average (AV) detector function and 9 kHz nominal bandwidth.

Then, appropriate correction factor —consists of transducer (LISN or voltage probe) factor and transmission loss (due to the attenuator, filter and/or transient suppressor, if any, and the cable) in the system— is applied to the receiver reading to calculate the corresponding emission level.

For example, if reading on the receiver is 33.0 dBμV, the transducer factor is 0.5 dB, and transmission loss (attenuation) in the coaxial cable and the attenuator is 10.5 dB, the emission level is calculated as:

$$33.0 \text{ dB}\mu\text{V} + 0.5 \text{ dB} + 10.5 \text{ dB} = 44.0 \text{ dB}\mu\text{V}.$$

Finally, the calculated emission level is compared with the upper limit specified in the standard.

Actual measurement will be carried out according to the appropriate edition of CISPR 16-2-1, CISPR 22, and ANSI C63.4 and/or other standards whichever applicable.

Specifically for 47 CFR 15 Subpart B, section 6 of ANSI C63.4-2003 is to be used for EUT arrangements and operations, and section 8 of the standard is to be used for radiated emissions measurement procedures.

B.2 Radiated Electric-Field Emissions (30 MHz to 1000MHz)

EUT is placed on a turn-table in a test site, on a wooden table 0.8 m height or on the floor unless otherwise specified in the standard.

Receiving antenna ---usually biconical, log-periodic or biconical/log-periodic hybrid---is positioned at the specified distance from the EUT.

For each polarization (horizontal and vertical), a spectrum analyzer is used to pre-scan the emissions while rotating the turn-table.

For each of the significant electromagnetic field detected, the test personnel discriminates EUT's emissions from the ambient noises.

For each of the significant emissions, maximum level of the emission is searched while rotating the turn-table and varying the antenna height between 1 m and 4 m, and the maximum signal level is read using a measuring receiver having CISPR 16 quasi-peak (QP) detector function and 120 kHz nominal bandwidth.

Then, appropriate correction factor —consists of antenna factor, amplifier gain and transmission loss (due to the attenuator and the cable loss) in the system— is applied to the receiver reading to calculate the corresponding field strength.

For example, if reading on the receiver is 33.0 dBμV, the antenna factor is 9.4 dB (1/m), the amplifier gain is 25.6 dB, and transmission loss (attenuation) in the coaxial cable and the attenuator is 6.5 dB, the field strength is calculated as: 33.0 dBμV + 9.4 dB (1/m) - 25.6 dB + 6.5 dB = 23.3 dBμV/m.

Finally, the calculated field strength is compared with the upper limit specified in the standard.

Actual measurement will be carried out according to the appropriate edition of CISPR 16-2-3, CISPR 22, and ANSI C63.4 and/or other standards whichever applicable.

Specifically for 47 CFR 15 Subpart B, section 6 of ANSI C63.4-2003 is to be used for EUT arrangements and operations, and section 8 of the standard is to be used for radiated emissions measurement procedures.

B.3 Radiated Electric-Field Emissions above 1000MHz

EUT is placed on a turn-table in a test site, on a wooden table 0.8 m height or on the floor unless otherwise specified in the standard.

Receiving antenna ---usually double ridge waveguide horn or standard horn--- is positioned at the specified distance from the EUT.

For each polarization (horizontal and vertical), a spectrum analyzer is used to pre-scan the emissions while rotating the turn-table.

For each of the significant electromagnetic field detected, the test personnel discriminates EUT's emissions from the ambient noises.

For each of the significant emissions, maximum level of the emission is searched while rotating the turn-table and varying the antenna height if it is required, and the maximum signal level is read using a spectrum analyzer or a measuring receiver having peak detector function and 1 MHz nominal bandwidth, unless otherwise specified in the standard. To obtain average readings with spectrum analyzers, video averaging (usually with VBW = 10 Hz) may be used.

As specified in the applicable standard, the antenna height would be (1) varied between 1 m and 4 m, or (2) varied so that the whole height of the EUT is covered by the main lobe of the receiving antenna, or (3) fixed to the approximate radiation center of the EUT.

Then, appropriate correction factor ---consists of antenna factor, amplifier gain and transmission loss (due to the attenuator and the cable loss) in the system--- is applied to the spectrum analyzer/receiver reading to calculate the corresponding field strength, and the result is compared with the upper limit specified in the standard.

Actual measurement will be carried out according to the appropriate edition of CISPR 16-2-3, CISPR 22, ANSI C63.4 and/or other standards whichever applicable.

Specifically for 47 CFR 15 Subpart B, section 6 of ANSI C63.4-2003 is to be used for EUT arrangements and operations, and section 8 of the standard is to be used for radiated emissions measurement procedures.