

## Report on the EMC Testing of:

Shikino High-Tech Co., Ltd.  
Camera Module,  
Model: KBCR-M04VG-HPB2033

In accordance with EN 55032, EN 55024

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Document Number: JPX-TR-19198-0

### SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Eiji Akiba	EMC Lab Manager	Approved Signatory	11 JUN 2019

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Japan Ltd. document control rules.

### EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with EN 55032 and EN 55024 (excluding the deviations mentioned in section 1.4 of this document).



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VLAC-013

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## 1 Summary of Test

### 1.1 Modification history of the test report

Document Number	Modification History	Issue Date
JPX-TR-19198-0	First Issue	Refer to the cover page

### 1.2 Standards

EN 55032:2015  
EN 55024:2010 + Amendment 1:2015

### 1.3 Normative references

EN 61000-4-2:2009  
EN 61000-4-3:2006 + Amendment 1:2008 + Amendment 2:2010

### 1.4 Deviation from standards

Standards referenced in the standards listed in section 1.2 are basically adopted. However, regarding the standards listed in section 1.3, the editions stated in the section were applied.

According to the judgment of the applicant, the tests listed in section 1.7 "List of applied test(s) of the EUT" with the remark \*3 were not performed.

This EUT is a built-in product and its outside is covered with non-metal material.  
As users cannot touch the FFC connector part while the EUT is operating, Electrostatic discharge immunity test was not performed to the part.  
As users may touch the lens part and the holder attachment part while the EUT is operating, Air discharge test was performed to the parts in accordance with the judgment of the applicant.  
Contact discharge and Indirect discharge tests were not applied because the lens part and the holder attachment part are not metal.

### 1.5 Test period

21-May-2019 - 30-May-2019

### 1.6 Test information

None

## 1.7 List of applied test(s) of the EUT

### Conducted emission, Radiated emission

Test Name	Class	Test	Result	Worst Point (Margin)	Remark
Conducted emission at mains port	-	Not applied	N/A	-	*1
Conducted emission at telecommunication port	-	Not applied	N/A	-	*1
Radiated emission (below 1 GHz)	Class A	Applied	PASS	V 120.000 MHz QP 0.9 dB	-
Radiated emission (above 1 GHz)	-	Not applied	N/A	-	*2

### Immunity of enclosure

Test Name	Performance criterion	Test	Result	Remark
Electrostatic discharge immunity	B	Applied	PASS	-
Radio-frequency electromagnetic field immunity	A	Applied	PASS	-
Power-frequency magnetic field immunity	-	Not applied	N/A	*3

### Immunity of AC power

Test Name	Performance criterion	Test	Result	Remark
Electrical fast transient/ burst immunity	-	Not applied	N/A	*1
Surges immunity	-	Not applied	N/A	*1
Conducted disturbances, induced by radio-frequency field immunity	-	Not applied	N/A	*1
Voltage dips, short interruption and voltage variations immunity	-	Not applied	N/A	*1

### Immunity of DC power

Test Name	Performance criterion	Test	Result	Remark
Electrical fast transient/ burst immunity	-	Not applied	N/A	*1
Surges immunity	-	Not applied	N/A	*1
Conducted disturbances, induced by radio-frequency field immunity	-	Not applied	N/A	*1

### Immunity of signal ports and telecommunication ports

Test Name	Performance criterion	Test	Result	Remark
Electrical fast transient/ burst immunity	-	Not applied	N/A	*1
Surges immunity	-	Not applied	N/A	*1
Conducted disturbances, induced by radio-frequency field immunity	-	Not applied	N/A	*1

\*1: Test is not applied because the EUT has no relevant ports.

\*2: Radiated emission (Above 1 GHz) is not applied because maximum frequency of EUT is 108 MHz or less.

\*3: As the EUT has no parts that are affected by magnetic field, the applicant determined that it would not be affected by magnetic field from outside and test is not applied.

## 1.8 Test setup

Table-top

## **1.9 Performance criteria**

### **- Performance criterion A**

The camera module performs capturing pictures normally. Operation stop or noise on the display does not occur.

### **- Performance criterion B**

Although noise on the display continues when applying pulse to the camera module, the noise disappears afterwards. EUT performs self-recovery.

### **- Performance criterion C**

When applying pulse to the camera module, noise on the display continues or the display freezes. However, when the application is restarted by manual operation, the camera module captures pictures normally and noise disappears.

## **1.10 Monitoring of EUT**

In order to evaluate the performance of equipment during the test, it is confirmed visually whether the EUT operates as intended.

In Radio-frequency electromagnetic field immunity, the second hand of the clock that is captured by the EUT is monitored in a separate room and its movement is visually confirmed.

## **1.11 Test Plan**

All the tests in this test report are performed according to test plan number: JPX-TP-19161-0

## **1.12 Deviation from the Test Plan**

None

## 2 Equipment Under Test

### 2.1 EUT information

Applicant	Shikino High-Tech Co., Ltd. Shin-Osaka Nishiura bldg, 6F 7-38, Nishimiyahara 2-chome, Yodogawa-ku, Osaka, 532-0004, Japan Phone: +81-6-615-7730 Fax: +81-6-6150-7739
Equipment Under Test (EUT)	Camera Module
Model number	KBCR-M04VG-HPB2033
Serial number	REA00903
Trade name	Shikino
Number of sample(s)	1
EUT condition	Pre-production
Maximum frequency	48 MHz
Power rating	DC 3.3 V 0.05 A
Size	(W) 27 × (D) 24 × (H) 18 mm
Weight	5 g

### 2.2 Modification to the EUT

The table below details modifications made to the EUT during the test project.

Modification State	Description of Modification	Modification fitted by	Date of Modification
KBCR-M04VG-HPB2033, S/N: REA00903			
0	As supplied by the applicant	Not Applicable	Not Applicable

### 2.3 Variation of family model(s)

#### 2.3.1 List of family model(s)

Not applicable

#### 2.3.2 Reason for selection of EUT

Not applicable

### 2.4 Operation mode

- REC mode
- i) Power ON
  - ii) Launch the app
  - iii) Start to Record for Video

### 3 Configuration of Equipment

Numbers assigned to equipment or cables in "3.1 Equipment(s) used" and "3.2 Cable(s) used" correspond to numbers in "3.3 System configuration".

#### 3.1 Equipment used

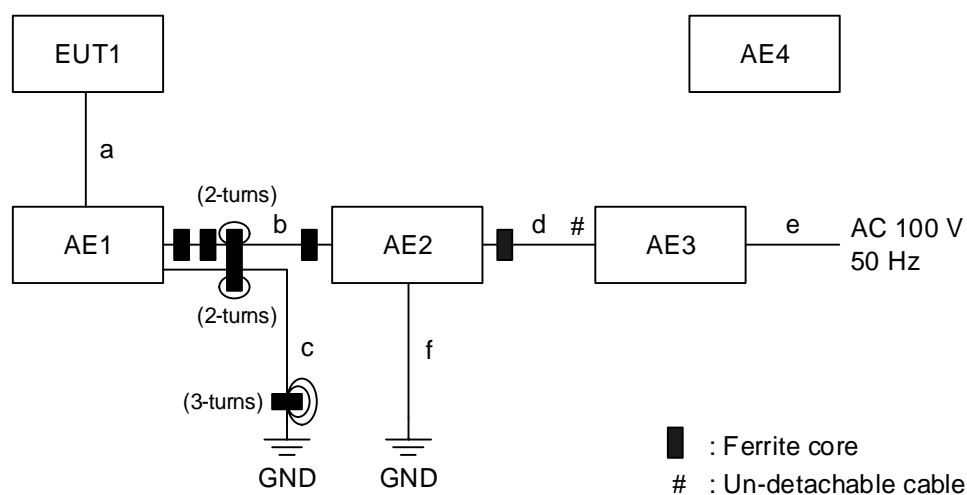
No.	Equipment	Company	Model No.	Serial No.	Remarks
EUT1	Camera Module	Shikino High-Tech Co.,Ltd.	KBCR-M04VG-HPB2033	REA00903	EUT
AE1	USB Transmitter Board	Shikino High-Tech Co.,Ltd.	KBCR-M01VX REV1.0	180404	-
AE2	Personal computer	Panasonic	CF-W2AW1AXP	3HKSA23512	-
AE3	AC adapter	Panasonic	CF-AA1625A M2	04804771B	-
AE4	Clock	N/A	N/A	N/A	*1

\*1: Used in Radio-frequency electromagnetic field immunity.

#### 3.2 Cable(s) used

No.	Cable	Length (m)	Shield	EUT accessory Ferrite core	Remarks
a	FFC (Flexible Flat Cable)	0.1	Yes	-	-
b	USB cable	2.0	Yes	-	-
c	Earth cable	1.6	No	-	-
d	DC cable	1.3	No	-	-
e	AC power cord	1.8	No	-	-
f	Earth cable	1.2	No	-	-

#### 3.3 System configuration



## 4 Test Result

### 4.1 Radiated emission (below 1 GHz)

#### 4.1.1 Measurement condition

EUT is placed on a non-conducting table for table-top equipment or on insulation material for a floor-standing equipment. The non-conducting table or the insulation material is placed on a rotating turn table. Excess cables between equipment are bundled in the center. The length of bundling is 0.3-0.4 m. An antenna is adjusted between 1-4 m in height and varied its polarization (horizontal and vertical), and the EUT azimuth is varied by the rotating turntable 0 to 360 degrees. After overall frequency range is investigated with spectrum analyzer using peak detector, measurements are performed with test receiver in setting to the defined values.

Items	Description
Frequency range	30 MHz-1000 MHz
Test place	10 m Semi-Anechoic Chamber No. 1
EUT was placed on	FRP table (W) 2.0 × (D) 1.0 × (H) 0.8 m
Axis	0°-360°
Antenna	Distance from EUT: 10 m Height: 1-4 m Polarity: Horizontal/Vertical
Test receiver setting	Detector: Quasi-peak Bandwidth: 120 kHz

#### 4.1.2 Calculation method

Emission level = Reading + c.f.\*

Margin = Limit - Emission level

\*Note: c.f. (correction factor) = Antenna factor + Cable system loss + ATT. loss - Amplifier Gain

Example)

Limit @ 350.0 MHz: 37.0 dBμV/m

Reading = 41.1 dBμV      c.f. = -11.8 dB/m

Emission level = 41.1 - 11.8 = 29.3 dBμV/m

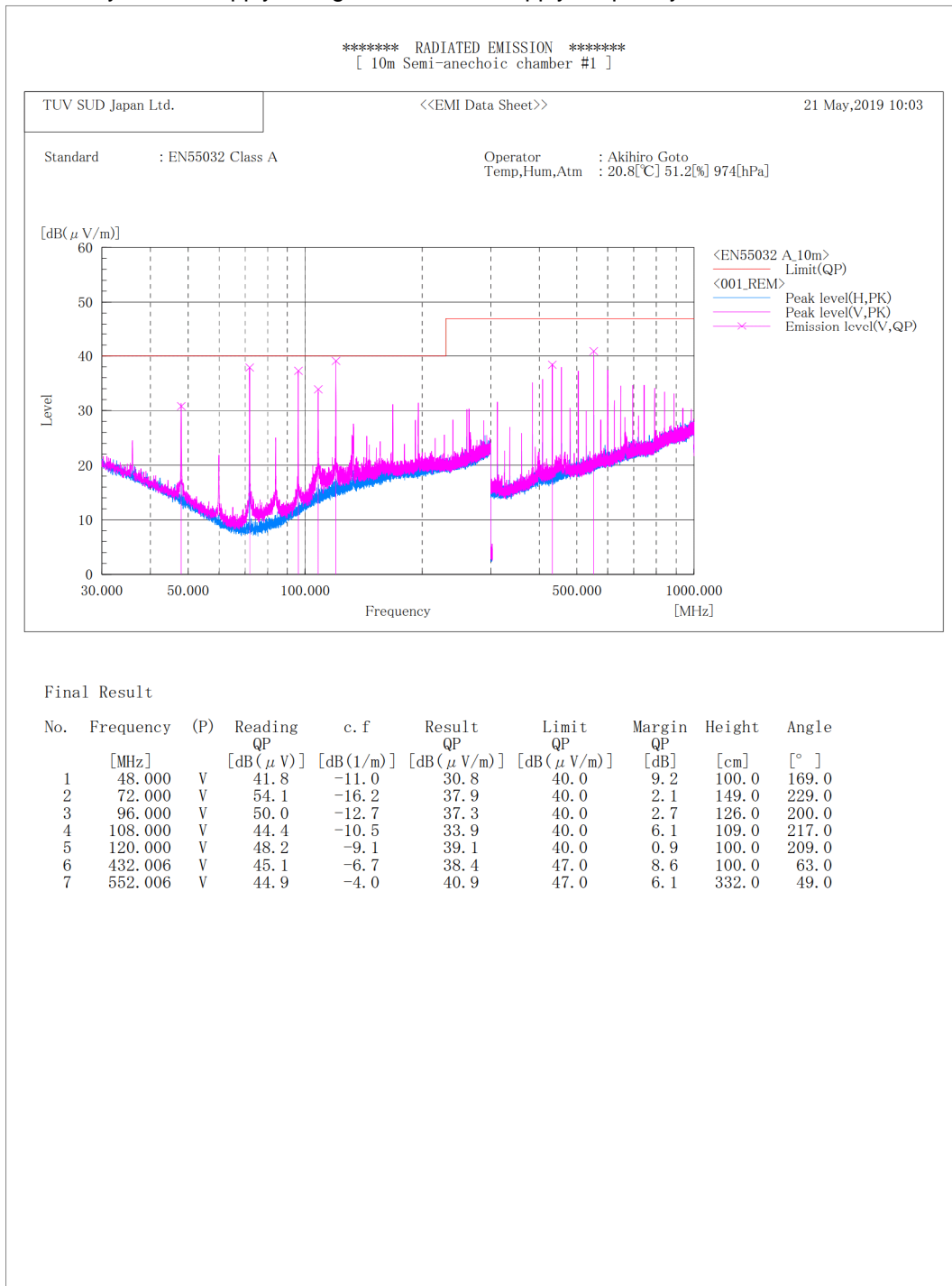
Margin = 37.0 - 29.3 = 7.7 dB



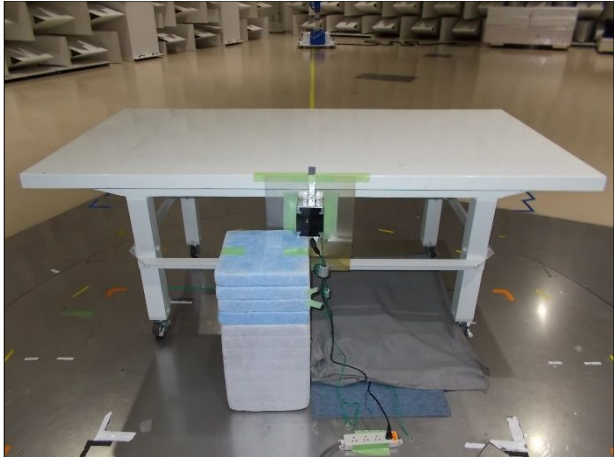
#### 4.1.3 Test data and Configuration photographs

Operation mode	REC mode
EUT	KBCR-M04VG-HPB2033, S/N: REA00903 - Modification State 0

Date of test: 21-May-2019 Supply voltage: AC 100 V Supply frequency: 50 Hz



Radiated emission (below 1 GHz)	REC mode
The photographs show maximized emission configuration.	



## 4.2 Electrostatic discharge immunity

### 4.2.1 Measurement condition

Table-top EUT is placed on a non-conducting table of 0.8 m height from the reference ground plane. A horizontal coupling plane (HCP) is installed on the table, and the EUT and its cables are insulated from the HCP with 0.5 mm thick insulator. The HCP is connected to the reference ground plane via a cable with a 470 kΩ resistor located at each end.

Floor-standing EUT is placed on a non-conducting support of 0.1 m height from the reference ground plane whenever possible. Cables of the EUT are insulated with 0.5 mm thick insulator. Unless otherwise specified in the standards, the test is applied to the points or surfaces which are accessible during normal operation. Discharges are applied to the edge of the HCP positioned at a distance of 0.1 m from the center of the EUT. The position of the EUT is changed in order that discharges are applied to all surfaces.

A vertical coupling plane (VCP) is connected to the reference ground plane via a cable with a 470 kΩ resistor located at each end. Discharges are applied to the middle of the edge of the VCP which is placed parallel to and positioned at a distance of 0.1 m from the EUT. The position of the VCP is changed in order that discharges are applied to 4 surfaces of the EUT.

Where electric charge needs to be removed, a cable with a 470 kΩ resistor located at each end is used.

Items	Description
Test method	EN 61000-4-2
Performance criterion	B
Test level *1	Contact discharge : - Air discharge : ±2 kV, ±4 kV, ±8 kV
Number of discharge *1	Contact discharge : - Air discharge : 10 single discharge
Time interval	1 sec.
Table size	Wooden table (W) 1.8 × (D) 0.9 × (H) 0.8 m
Horizontal coupling plane size	1.6 m × 0.8 m
Vertical coupling plane size	0.5 m × 0.5 m

\*1: This EUT is a built-in product and its outside is covered with non-metal material.

As users cannot touch the FFC connector part while the EUT is operating, Electrostatic discharge immunity test was not performed to the part.

As users may touch the lens part and the holder attachment part while the EUT is operating, Air discharge test was performed to the parts in accordance with the judgment of the applicant. Contact discharge and Indirect discharge tests were not applied because the lens part and the holder attachment part are not metal.

Discharge point, **Light blue square: Air discharge**  
Number: Point where degradation of performance appeared.

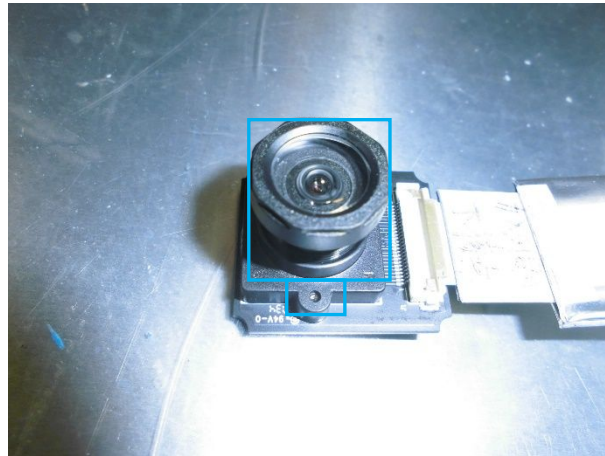


Figure 1

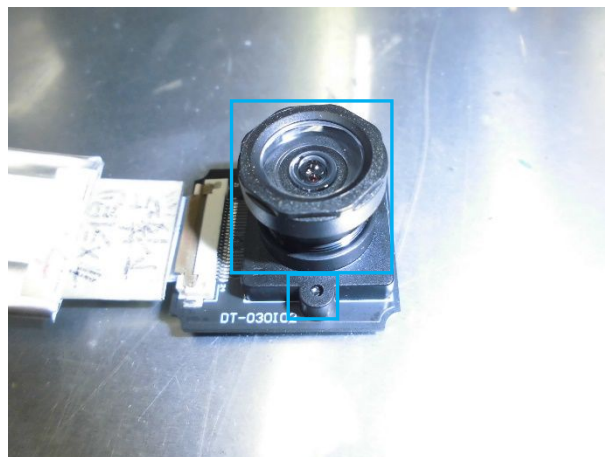


Figure 2

Operation mode	REC mode
EUT	KBCR-M04VG-HPB2033, S/N: REA00903 - Modification State 0

Date of test / Climatic condition : 30-May-2019 / 20.5 °C, 40.6 %, 987 hPa  
 Test place : Shielded room No.1  
 Test engineer : Tadayoshi Yamagishi

Supply voltage: AC 100 V Supply frequency: 50 Hz

#### Air discharge to insulating surface

Discharge Point (Refer to discharge locations)	Result of performance criterion						Test result
	Test voltage 2 kV		Test voltage 4 kV		Test voltage 8 kV		
	+	-	+	-	+	-	
Air discharge	A	A	A	A	A	A	PASS

Electrostatic discharge immunity	REC mode
----------------------------------	----------

#### Air discharge



### 4.3 Radio-frequency electromagnetic field immunity

#### 4.3.1 Measurement condition

Table-top EUT is placed on a non-conducted table of 0.8 m height, and floor-standing EUT is placed, as far as possible, on an insulating support about 0.1 m height on the floor.

For cables of the EUT, as far as possible, typical arrangement and usage of the EUT are simulated, and the cables are placed to be exposed to electromagnetic field by 1.0 m or more whenever possible.

The EUT is placed in order that the face to be illuminated coincides with uniform electric field. Where the independent windows method is applied, the EUT is placed to coincide with the applicable window.

During the test, the EUT and the cables are illuminated by supplying the power obtained from electric field calibration to the field generating antenna and by sweeping signals modulated over the frequency ranges to be considered. In addition, the dwell time is designated by the applicant.

The tests are repeated to illuminate the faces to be tested (4 or 6 faces of the EUT) to both horizontal and vertical polarizations.

Items	Description
Test method	EN 61000-4-3
Performance criterion	A
Test level	3 V/m
Frequency range	80 MHz-1000 MHz
Frequency step	1 %
Dwell time	3.0 sec.
Modulation	AM 80 %, 1 kHz
EUT direction	Front, Right, Back, Left, Top, Bottom
Antenna polarity	Horizontal and Vertical
Test distance	1.4 m
Antenna height	1.18 m
Table size	Styrene foam table (W) 1.0 × (D) 0.3 × (H) 0.8 m

In Radio-frequency electromagnetic field immunity, the second hand of the clock that is captured by the EUT is monitored in a separate room and its movement is visually confirmed.

Operation mode	REC mode
EUT	KBCR-M04VG-HPB2033, S/N: REA00903 - Modification State 0

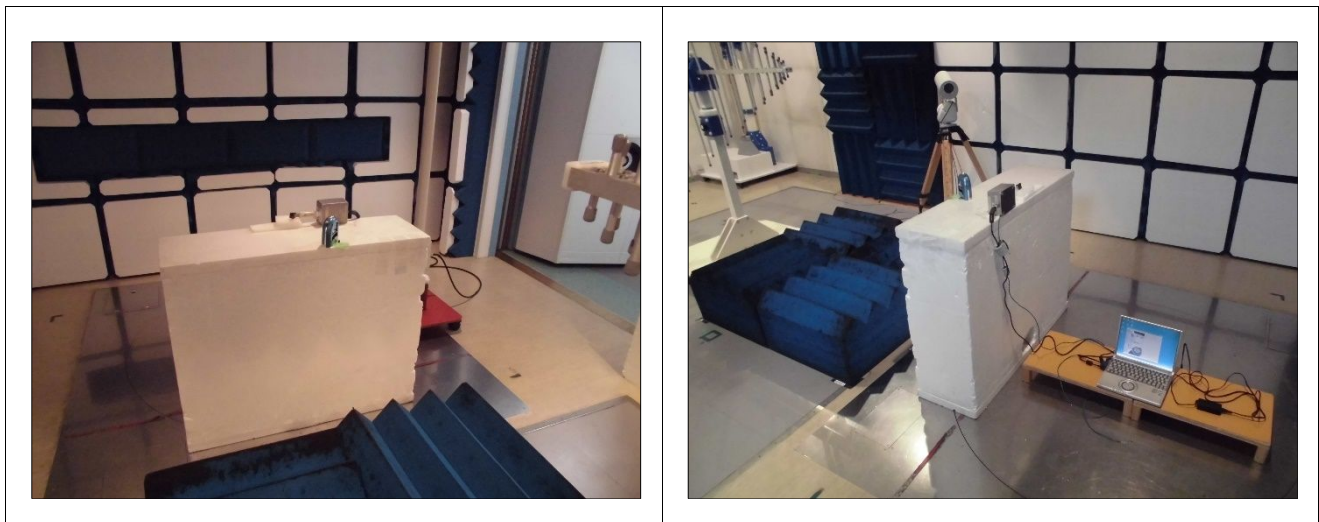
Date of test / Climatic condition : 28-May-2019 / 23.5 °C, 50.0 %, 982 hPa  
 Test place : Small anechoic chamber  
 Test engineer : Tadayoshi Yamagishi

Supply voltage: AC 100 V Supply frequency: 50 Hz

#### 80 MHz-1000 MHz

EUT direction	Test level (V/m)	Antenna polarity	Result of performance criterion	Test result
Front (0°)	3	Horizontal	A	PASS
		Vertical	A	PASS
Right (90°)	3	Horizontal	A	PASS
		Vertical	A	PASS
Back (180°)	3	Horizontal	A	PASS
		Vertical	A	PASS
Left (270°)	3	Horizontal	A	PASS
		Vertical	A	PASS
Top	3	Horizontal	A	PASS
		Vertical	A	PASS
Bottom	3	Horizontal	A	PASS
		Vertical	A	PASS

Radio-frequency electromagnetic field immunity	REC mode
The following photographs show representative arrangement.	





## 5 Measurement Uncertainty

The reported measurement uncertainty is based on a value obtained by multiplying standard uncertainty by coverage factor of  $k=2$ , and a level of confidence becomes 95 %.

Item	Parameter	$U_{lab}$	$U_{cispr}$
Conducted Emission, AMN	9kHz to 150kHz	$\pm 3.8$ dB	$\pm 3.8$ dB
Conducted Emission, AMN	150kHz to 30MHz	$\pm 3.3$ dB	$\pm 3.4$ dB
Conducted Emission, Voltage Probe	9kHz to 30MHz	$\pm 2.8$ dB	$\pm 2.9$ dB
Conducted Emission, AAN	150kHz to 30MHz	$\pm 4.9$ dB	$\pm 5.0$ dB
Conducted Emission, Current Probe	150kHz to 30MHz	$\pm 2.9$ dB	$\pm 2.9$ dB
Disturbance Power	30MHz to 300MHz	$\pm 4.2$ dB	$\pm 4.5$ dB
Radiated Emission	30MHz to 1000MHz	$\pm 4.9$ dB	$\pm 6.3$ dB
Radiated Emission	1GHz to 6GHz	$\pm 4.8$ dB	$\pm 5.2$ dB
Radiated Emission	6GHz to 18GHz	$\pm 5.1$ dB	$\pm 5.5$ dB
Radiated Emission	9kHz to 30MHz	$\pm 3.1$ dB	-
Harmonics current	-	$\pm 4.2$ %	-
Voltage Fluctuations	-	$\pm 6.3$ %	-
Radiated Immunity test	80MHz to 1GHz	$\pm 2.0$ dB	-
Radiated Immunity test	1GHz to 6GHz	$\pm 3.4$ dB	-
Conducted Immunity test, CDN	150kHz to 80MHz	$\pm 1.4$ dB	-
Conducted Immunity test, EM Clamp	150kHz to 80MHz	$\pm 3.2$ dB	-
Conducted Immunity test, BCI	150kHz to 80MHz	$\pm 3.3$ dB	-
Conducted Immunity test, Direct Injection	150kHz to 80MHz	$\pm 3.1$ dB	-
Electromagnetic fields test	10Hz to 400kHz	$\pm 8.9$ %	-

Measurement uncertainty of not listed immunity tests is considered to suffice because requirements of relevant standards are met.



## 6 Laboratory Information

Testing was performed and the report was issued at:

**TÜV SÜD Japan Ltd. Yonezawa Testing Center**

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**Accreditation and Registration**

VLAC

Accreditation No.: VLAC-013

NVLAP

LAB CODE: 200306-0

BSMI

Laboratory Code: SL2-IN-E-6018, SL2-A1-E-6018

VCCI Council

Registration number	Expiration date
A-0166	03-July-2019

## Appendix A. Test Equipment

### Radiated emission (below 1 GHz)

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
EMI receiver	ROHDE&SCHWARZ	ESR7	101742	31-Jan-2020	25-Jan-2019
Biconical antenna	Schwarzbeck	VHA9103/BBA9106	VHA91032850	31-Oct-2019	17-Oct-2018
Log periodic antenna	Schwarzbeck	UHALP9108A	0992	31-Jul-2019	23-Jul-2018
Attenuator	TDC	TAT-43B-06	N/A(S209)	31-Jul-2019	11-Jul-2018
Attenuator	TAMAGAWA.ELEC	CFA-01NPJ-3	N/A(S270)	31-May-2019	16-May-2018
Microwave cable	HUBER+SUHNER	SUCOFLEX104/9m	MY23758/4	31-Oct-2019	10-Oct-2018
Microwave cable	HUBER+SUHNER	SUCOFLEX104/1m	MY24628/4	31-Oct-2019	10-Oct-2018
Microwave cable	HUBER+SUHNER	SUCOFLEX104/2m	SN MY28398/4	31-Oct-2019	10-Oct-2018
Microwave cable	HUBER+SUHNER	SUCOFLEX106/12m	41624/6	31-Oct-2019	12-Oct-2018
Preamplifier	ANRITSU	MH648A	M96057	31-Jan-2020	17-Jan-2019
10m Semi-anechoic Chamber	TOKIN	N/A	N/A(9001-NSA10m)	31-Oct-2019	12-Oct-2018
PC	HP	dc7800small	JPA7450FPJ	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V5.6.0	N/A	N/A

### Electrostatic discharge immunity

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. Date
ESD simulator	Noise Laboratory Co., Ltd.	ESS-2002	ESS0493502	31-Oct-2019	29-Oct-2018

### Radio-frequency electromagnetic field immunity

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. Date
Signal generator	ROHDE&SCHWARZ	SMB100A	113728	31-Dec-2019	19-Dec-2018
Millivolt meter	ROHDE&SCHWARZ	URV5	860617/064	31-May-2020	16-May-2019
Power sensor	ROHDE&SCHWARZ	NRV-Z5	100149	31-May-2020	16-May-2019
Power sensor	ROHDE&SCHWARZ	NRV-Z5	100513	31-May-2020	16-May-2019
Electric field probe	Amplifier Research	FL7006	0326694	30-Jun-2019	14-Jun-2018
Electric field monitor	Amplifier Research	FM7004	0327186	30-Jun-2019	14-Jun-2018
Laser Probe Interface	Amplifier Research	FL7000	0326201	N/A	N/A
Log periodic antenna	Schwarzbeck	VULP9118E	901	31-Dec-2019	20-Dec-2018
RF Power Amplifier	PRANA	AP32MT255	0802-0844	31-May-2020	16-May-2019
Directional coupler	WERLATONE	C3908-728	110444	31-Jul-2019	12-Jul-2018
Small Semi-anechoic Chamber	TOKIN	N/A	N/A(9003)	31-Mar-2020	27-Mar-2019
Software	TSJ	TEPTO-RS/ANT	Ver.4.8.336	N/A	N/A