EMC Test Report

Test Report Number	T-1967537-01
Applied Standard(s)	EN55032:2012 EN55024:2010
Date of Issue	2 August, 2019
Testing Laboratory **Address**	e-OHTAMA, LTD. Tokyo Laboratory 2-8-20 Kurigi, Asao-ku, Kawasaki-shi, Kanagawa, 215-0033 JAPAN
Test Date(s)	10 July, 2019 to 16 July, 2019
Product Name*	GR-ROSE
Model Number*	X65A-M01
Serial Number*	-
Applicant (Client) * **Address***	CORE CORPORATION 11-1 Minami-Kurokawa, Asao-ku, Kawasaki-shi, Kanagawa 215-0034 Japan
Manufacturer* **Address***	CORE CORPORATION 11-1 Minami-Kurokawa, Asao-ku, Kawasaki-shi, Kanagawa 215-0034 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

VLAC Lab Accreditation
VLAC-018-1

Approved by H. Sugita

Hiroshi Sugita
Manager

In this report, Information followed "*" were given by the applicant.

Table of Contents

Page

Cover Page....1
Table of Contents....2
1. Summary....3
1.1 Standard(s) and Result....3
1.2 Deviations from Standard(s)....3
1.3 Performance Criteria※....4
1.4 Monitoring of the Performance※....4
2. Equipment Under Test (EUT)※....5
2.1 General Descriptions....5
2.2 Detailed Descriptions....5
2.3 Modification to the EUT....5
2.4 Operation Mode(s) of the EUT....5
2.5 EUT, Peripheral Devices and Interconnecting Cables....6
2.6 System Configuration....7
3. Test Data....8
3.1 Conducted Emissions (Telecommunications)....8
3.2 Radiated Electric-Field Emissions (Below 1 GHz)....12
3.3 Radiated Electric-Field Emissions (Above 1 GHz)....17
3.4 Electrostatic Discharge Immunity....22
3.5 RF Electromagnetic Field Immunity....25
3.6 Electrical Fast Transient/Burst Immunity....27
3.7 RF Conducted Immunity....29
3.8 Power Frequency Magnetic Field Immunity....31
4. Test facility....34
4.1 Test Instruments....34
4.2 Test equipment....36
4.3 Normalized Site Attenuation....36
Annex A (Miscellaneous Information)....37
A.1 Test Locations....37
A.2 Uncertainty....37
Annex B (Description of Test Method)....38
B.1 Conducted Emissions (AC Main and Other Terminals)....38
B.2 Conducted Emissions (Telecommunications)....38
B.3 Radiated Electric-Field Emissions (Below 1 GHz)....39
B.4 Radiated Electric-Field Emissions (Above 1 GHz)....39
B.5 Radiated Magnetic-Field Emissions....40
B.6 Disturbance Power....40
B.7 Harmonic Current Emissions....40
B.8 Voltage fluctuations and Flickers....41
B.9 Electrostatic Discharge Immunity....41
B.10 RF Electromagnetic Field Immunity....41
B.11 Electrical Fast Transient/Burst Immunity....42
B.12 Surge Immunity....42
B.13 RF Conducted Immunity....42
B.14 Power Frequency Magnetic Field Immunity....43
B.15 Voltage Dips, Short Interruptions Immunity....43

1. Summary

1.1 Standard(s) and Result

Applied Standard(s)	Normative Reference(s)	Classification	Result	Note
EN55032:2012	-	Class A	Pass	1
EN55024:2010	EN61000-4-2:2009	-	Pass	
	EN61000-4-3:2006+A1:2008+A2:2010	-	Pass	
	EN61000-4-4:2004	-	Pass	
	EN61000-4-5:2006	-	N/A	2
	EN61000-4-6:2009	-	Pass	
	EN61000-4-8:2010	-	Pass	
	EN61000-4-11:2004	-	N/A	3

Remarks: The test complied with the applicant's test plan.
Note:1 Not subject to conducted emission test because of DC equipment.
Note:2 Not tested because there is no port to be tested.
Note:3 Not subject to test because of DC equipment.

1.2 Deviations from Standard(s)

There was no deviation from the standard.

1.3 Performance Criteria※

Performance Criterion A
The LED (green / red) keeps blinking.
There is no NG in serial communication.
There is no NG in Ping.

Performance Criterion B
After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by permissible loss of performance.

During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.

If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.

Performance Criterion C
During and after testing, a temporary loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls or cycling of the power to the EUT by the user in accordance with the manufacturer's instructions.

Judgment in the immunity test result(s) corresponds to the performance criteria above.

1.4 Monitoring of the Performance※

- LED (green)
- LED (red)
- PC monitor

2. Equipment Under Test (EUT) ※※

2.1 General Descriptions

Evaluation board

2.2 Detailed Descriptions

Product Name	GR-ROSE
Model Number	X65A-M01
Serial Number	-
Power Supply	12 V dc, 30 VA
Dimension	45.0 mm (W) x 17.5 mm (H) x 50.0 mm (D)
Highest Operating Frequency	120 MHz
Normal Placement	Table-top
Condition of the EUT	Product on production line

2.3 Modification to the EUT

There was no modification or measure.

2.4 Operation Mode(s) of the EUT

Operation Mode Name	Description	Software Name	Version
All Test without Wi-Fi	Test everything except Wi-Fi (LED (green / red), serial communication, LAN).	GR-ROSE_All_withoutWiFi_On.ttl	1
All Test with Wi-Fi	Test all (LED (green / red), serial communication, LAN, Wi-Fi).	GR-ROSE_All_withWiFi_On.ttl	1

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	Manufacturer
EUT	GR-ROSE	X65A-M01	-	CORE CORPORATION

2.5.2 Peripheral Devices

Mark	Description	Model Number	Serial Number	Manufacturer
A	Personal Computer	V5F18AV	JPH803XLHS	HP Japan Inc.
B	AC Adapter	HSTNN-CA41	-	HP Japan Inc.
C	HUB	TL-SG105	2188294012405	TP-Link
D	Desktop Computer	ThinkCentre M70e	R8C6E9K	Lenovo
E	Display	9205-AB6	V6-MP024	IBM
F	Keyboard	LXH-EKB-10YA	20300938	Lenovo
G	Mouse	1004	X800495	Microsoft
H	AC adapter for HUB	T090060-2B1	-	TP-Link

2.5.3 Interconnecting Cables

Mark	Description	Length (m)	Shielded		Tested Port(s) (Note:1)		Identification
			Cable	Connector	Applicable	Interface	
①	DC Power Cable	1.0	None	None	Yes	DC Power	—
②	USB Cable	3.0	Yes	Yes	Yes	Signal	BSMPCMB130BK
③	LAN Cable	5.0	None	None	Yes	Signal	BSLS5ENU50BL2
④	DC Power Cable	1.0	None	None	No	-	—
⑤	AC Power Cord	1.0	None	None	No	-	—
⑥	Serial Loopback Cable	0.01	None	None	No	-	—
⑦	LAN Cable	5.0	None	None	No	-	BSLS5ENU50BL2
⑧	LAN Cable	10.0	None	None	No	-	—
⑨	Display Cable	0.7	Yes	Yes	No	-	—
⑩	Keyboard Cable	1.9	Yes	Yes	No	-	—
⑪	Mouse Cable	1.8	Yes	Yes	No	-	—
⑫	DC Cable (for HUB)	1.4	None	None	No	-	—
⑬	AC Cable (for Desktop Computer)	2.0	None	None	No	-	—
⑭	AC Cable (for Display)	2.0	None	None	No	-	—

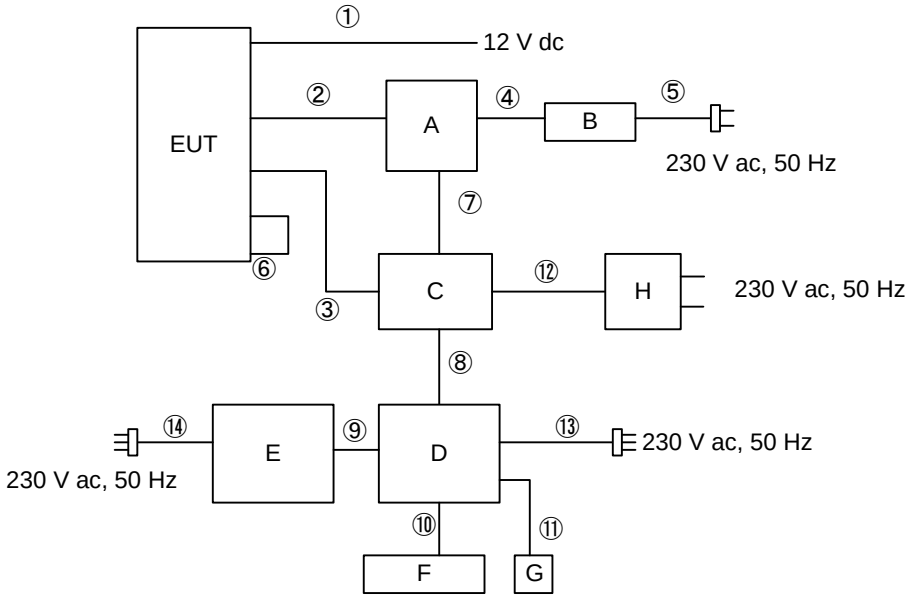
Note:1 Tested port(s) required for applicable standard(s).

Remarks: The length described here is the length of the cable typically used in the tests, but different length of the cable may be used in some tests to satisfy the requirements for the test.

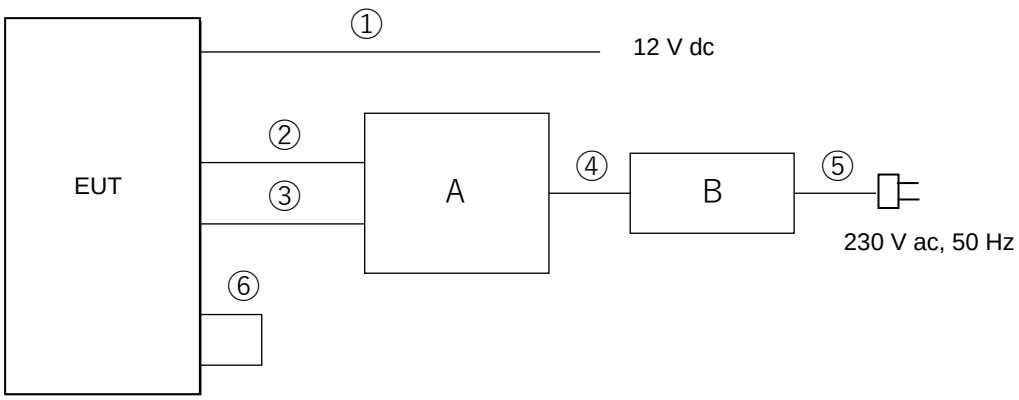
2.6 System Configuration

Unless otherwise specified in the following sections, the test configuration described here is applied for the tests. The configuration was chosen by the applicant.

Conducted Emissions and Radiated Electric-Field Emissions test only



Except Conducted Emissions and Radiated Electric-Field Emissions test



3. Test Data

3.1 Conducted Emissions (Telecommunications)

3.1.1 Test specification

Standard	EN55032:2012
Class of Equipment	Class A
Frequency Range	150 kHz to 30 MHz
Test Date	12 July, 2019
Test Location	Tokyo Laboratory No.3 EMC test room
Test Engineer	Shoichi Eguchi
Temperature	23 °C
Humidity	55 % RH
Pressure	999 hPa
Power Supply	12 V dc
Operation Mode Name	All Test without Wi-Fi
Transfer Rate	100Base-Tx
Cable	Category 5e (UTP)

3.1.1.1 Test Result

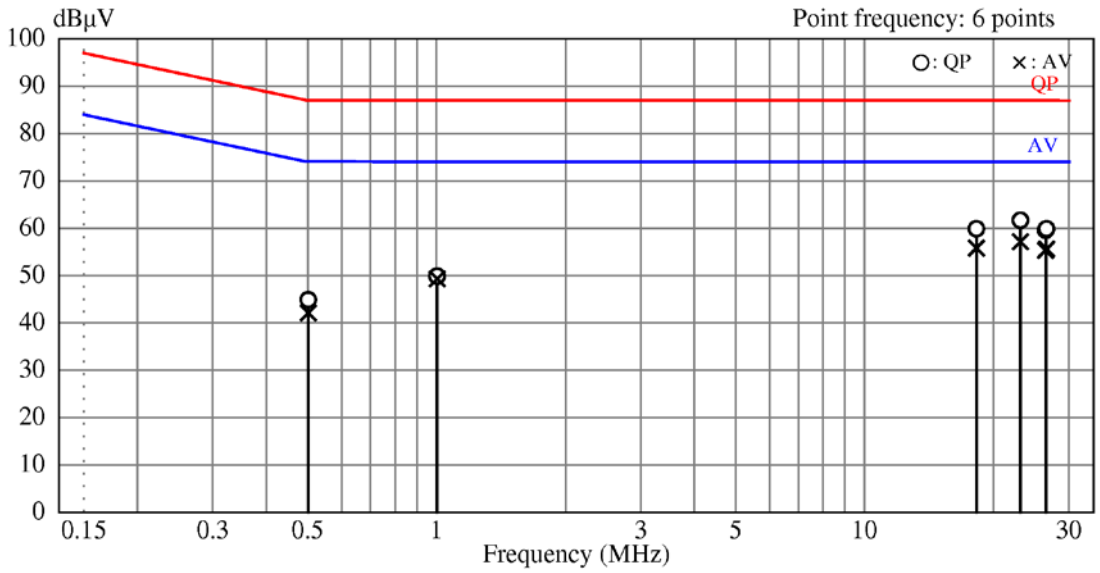
Pass

3.1.1.2 Test Detail

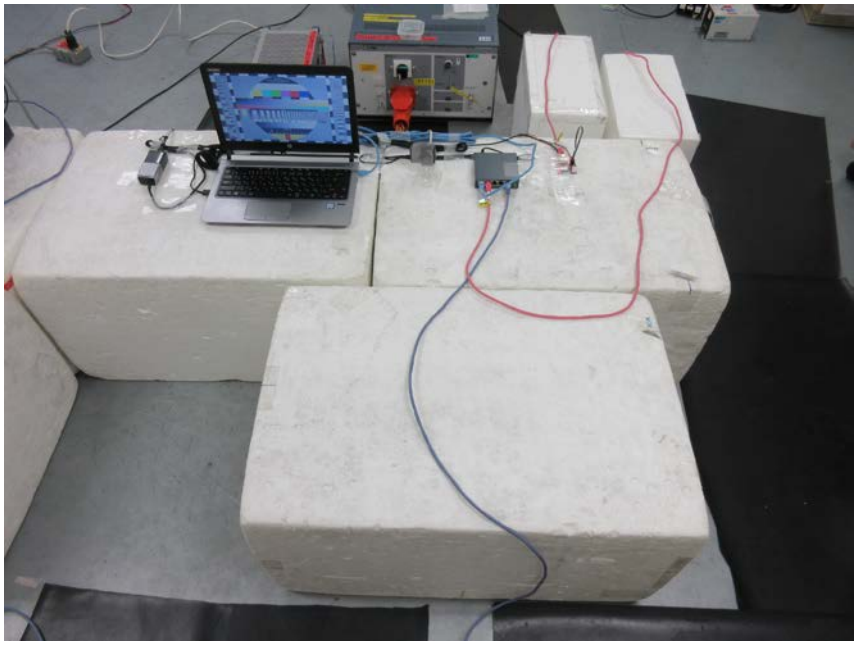
Tested Port	Minimum limit margin	Note
LAN Cable (Mark ③)	16.8 dB at 23.1280 MHz (AV)	

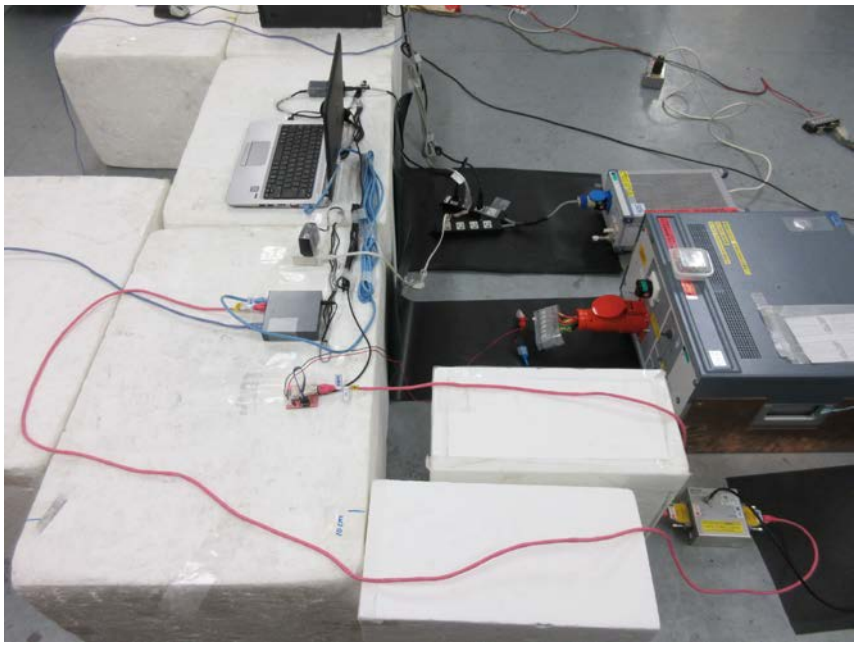
3.1.1.3 All Test without Wi-Fi

Frequency (MHz)	Reading (dBµV)		Correction factor (dB)	Noise level (dBµV)		Limit (dBµV)		Margin (dB)	
	QP	AV		QP	AV	QP	AV	QP	AV
0.5014	35.2	32.4	9.7	44.9	42.1	87.0	74.0	42.1	31.9
1.0028	40.2	39.6	9.7	49.9	49.3	87.0	74.0	37.1	24.7
18.2431	49.3	45.2	10.6	59.9	55.8	87.0	74.0	27.1	18.2
23.1280	50.8	46.3	10.9	61.7	57.2	87.0	74.0	25.3	16.8
26.4869	48.5	44.2	11.1	59.6	55.3	87.0	74.0	27.4	18.7
26.6090	48.8	44.5	11.1	59.9	55.6	87.0	74.0	27.1	18.4



3.1.2 Test Setup Photograph(s) (EUT)





3.1.3 Test Setup Photograph(s) (Peripheral)

3.2 Radiated Electric-Field Emissions (Below 1 GHz)

3.2.1 Test Specification

Standard	EN55032:2012
Class of Equipment	Class A
Test Distance	10 m
Frequency Range	30 MHz to 1 GHz
Test Date	10 July, 2018
Test Location	Tokyo Laboratory No.1 EMC test room
Test Engineer	Shoichi Eguchi
Temperature	26 °C
Humidity	66 % RH
Pressure	1012 hPa
Power Supply	12 V dc
Operation Mode Name	All Test without Wi-Fi

3.2.1.1 Test Result

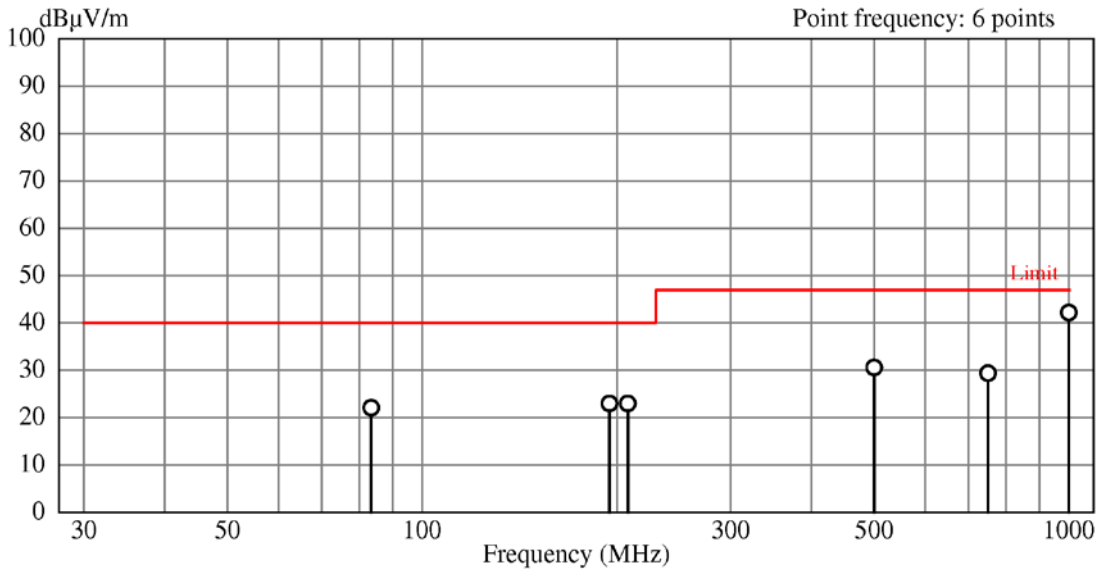
Pass

3.2.1.2 Test Detail

Minimum limit margin	Note
4.8 dB at 999.99 MHz	

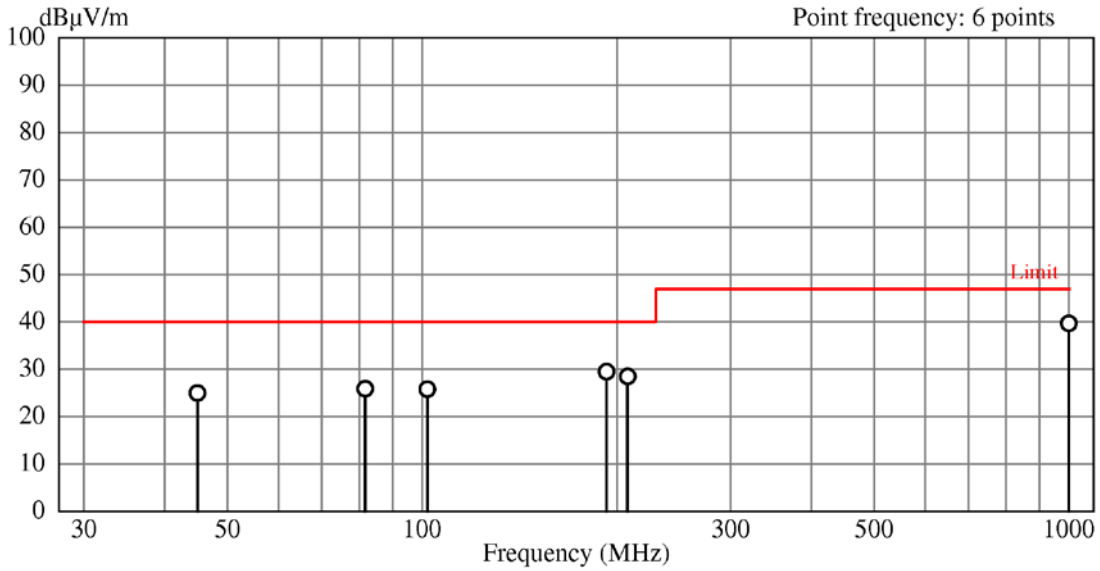
3.2.1.3 All Test without Wi-Fi, Below 1 GHz (10 m), Horizontal

Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Noise level (dBµV/m)	Antenna height (m)	Turn table angle (°)	Limit (dBµV/m)	Margin (dB)
83.43	32.6	-10.5	22.1	4.0	359	40.0	17.9
194.86	30.3	-7.3	23.0	4.0	50	40.0	17.0
207.99	30.6	-7.6	23.0	4.0	227	40.0	17.0
500.00	29.7	0.9	30.6	2.4	355	47.0	16.4
749.99	23.2	6.2	29.4	1.2	97	47.0	17.6
999.99	32.0	10.2	42.2	2.6	343	47.0	4.8

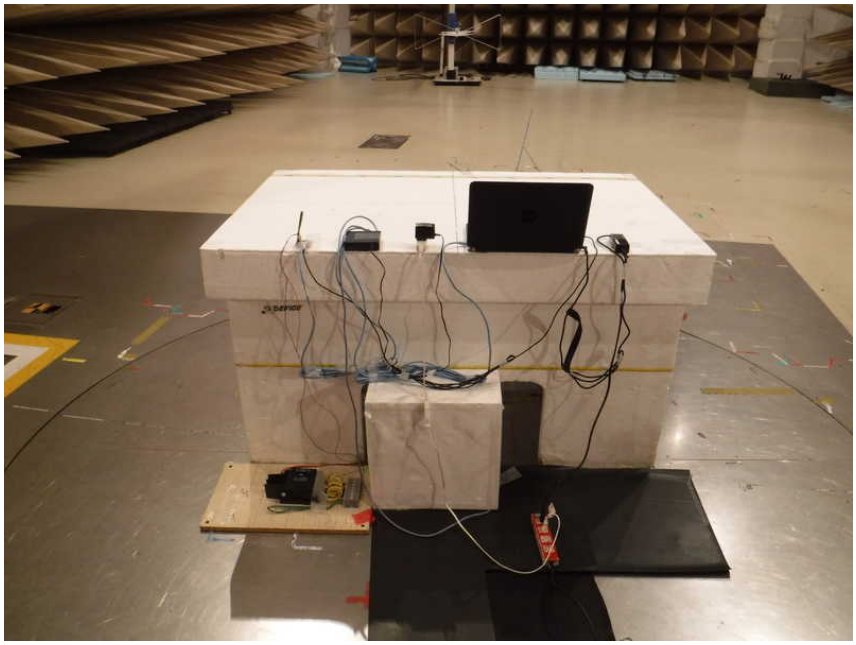


3.2.1.4 All Test without Wi-Fi, Below 1 GHz (10 m), Vertical

Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Noise level (dBµV/m)	Antenna height (m)	Turn table angle (°)	Limit (dBµV/m)	Margin (dB)
44.94	31.0	-6.0	25.0	2.6	134	40.0	15.0
81.67	36.1	-10.2	25.9	1.6	97	40.0	14.1
101.87	35.2	-9.4	25.8	1.6	277	40.0	14.2
192.86	36.7	-7.2	29.5	1.0	108	40.0	10.5
207.94	36.1	-7.6	28.5	1.0	346	40.0	11.5
999.99	29.5	10.2	39.7	1.0	308	47.0	7.3



3.2.2 Test Setup Photograph(s) (EUT)



3.2.3 Test Setup Photograph(s) (Peripheral)

3.3 Radiated Electric-Field Emissions (Above 1 GHz)

3.3.1 Test Specification

Standard	EN55032:2012
Class of Equipment	Class A
Test Distance	3 m
Frequency Range	1 GHz to 2 GHz
Test Date	10 July, 2019
Test Location	Tokyo Laboratory No.1 EMC test room
Test Engineer	Shoichi Eguchi
Temperature	26 °C
Humidity	66 % RH
Pressure	1 012 hPa
Power Supply	12 V dc
Operation Mode Name	All Test without Wi-Fi

3.3.1.1 Test Result

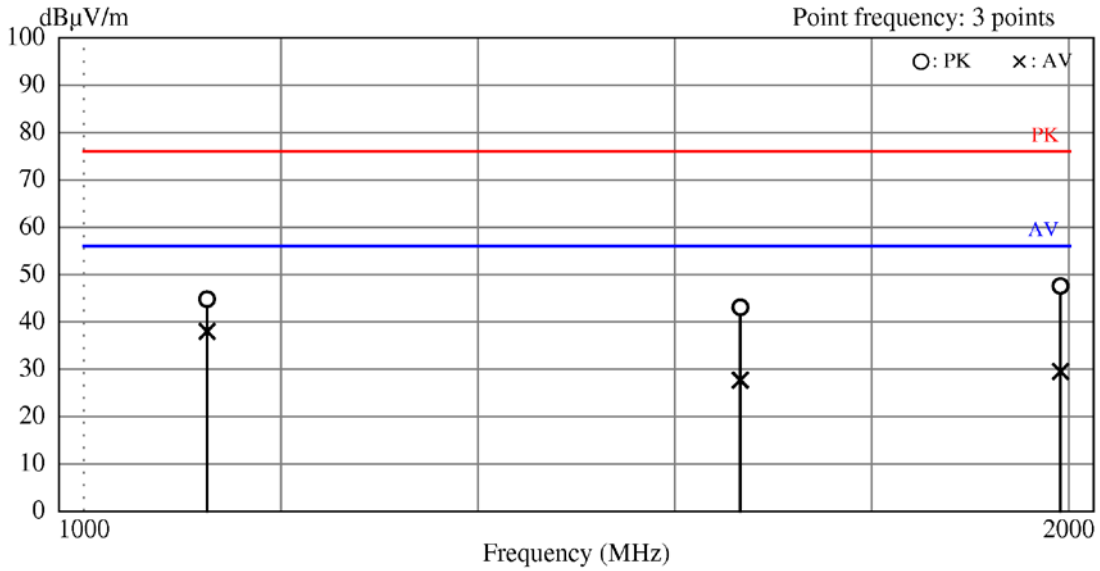
Pass

3.3.1.2 Test Detail

Minimum limit margin	Note
11.0 dB at 1125.00 MHz (AV)	

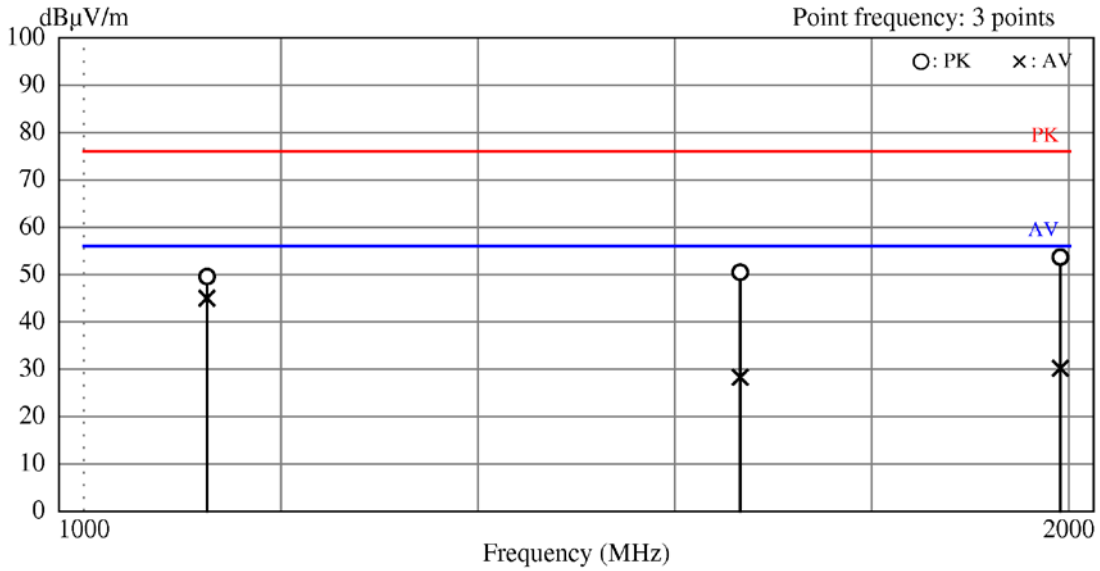
3.3.1.3 All Test without Wi-Fi, Above 1 GHz (3 m), Horizontal

Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Noise level (dBµV/m)	Antenna height (m)	Turn table angle (°)	Limit (dBµV/m)	Margin (dB)	Detector Mode
1125.00	50.6	-5.8	44.8	1.0	63	76.0	31.2	PK
1125.00	43.8	-5.8	38.0	1.0	63	56.0	18.0	AV
1666.51	45.8	-2.7	43.1	1.0	253	76.0	32.9	PK
1666.51	30.4	-2.7	27.7	1.0	253	56.0	28.3	AV
1991.56	47.7	-0.1	47.6	1.0	48	76.0	28.4	PK
1991.56	29.6	-0.1	29.5	1.0	48	56.0	26.5	AV

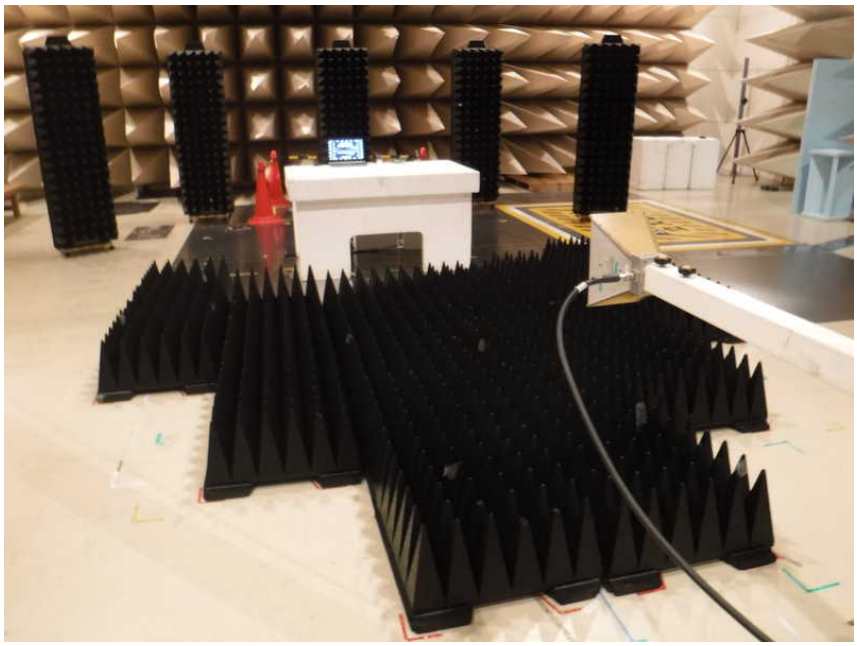


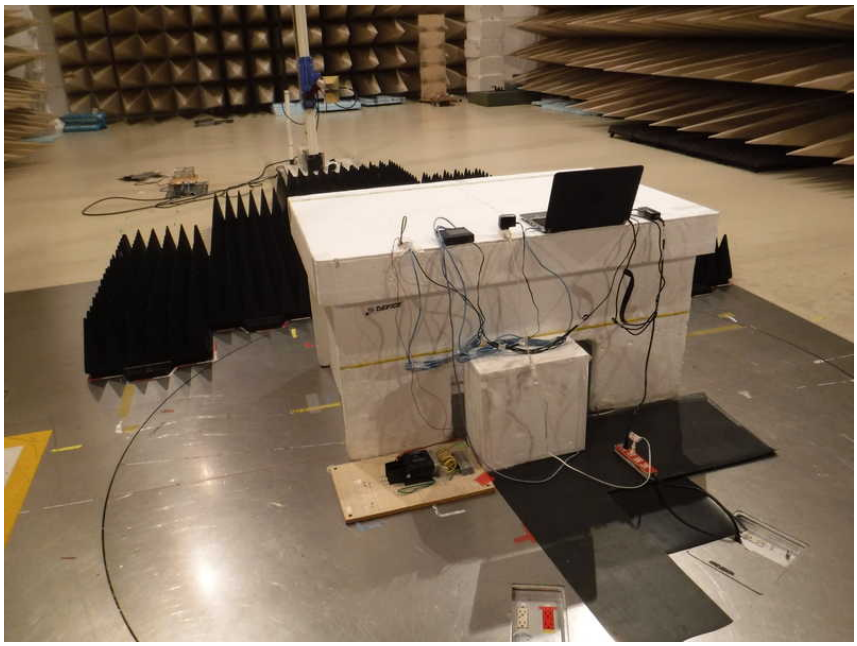
3.3.1.4 All Test without Wi-Fi, Above 1 GHz (3 m), Vertical

Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Noise level (dBµV/m)	Antenna height (m)	Turn table angle (°)	Limit (dBµV/m)	Margin (dB)	Detector Mode
1125.00	55.4	-5.8	49.6	1.0	26	76.0	26.4	PK
1125.00	50.8	-5.8	45.0	1.0	26	56.0	11.0	AV
1666.32	53.2	-2.7	50.5	1.0	26	76.0	25.5	PK
1666.32	31.0	-2.7	28.3	1.0	26	56.0	27.7	AV
1991.42	53.8	-0.1	53.7	1.0	339	76.0	22.3	PK
1991.42	30.3	-0.1	30.2	1.0	339	56.0	25.8	AV



3.3.2 Test Setup Photograph(s) (EUT)





3.3.3 Test Setup Photograph(s) (Peripheral)

3.4 Electrostatic Discharge Immunity

3.4.1 Test Specification

Standard	EN55024:2010
Basic Standard	EN61000-4-2:2009
Test Level	
(Contact Discharge)	4 kV
(Air Discharge)	8 kV
Polarity	Positive and Negative
Kind of Discharges	Contact discharge and Air discharge
Kind of Indirect Discharges	Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP)
Number of Discharges	10 or 25 discharges (each polarity) / preselected 1 point
Kind of Charge Removed	Carbon fiber brush with bleeder resistors
Performance Criterion	B
Test Date	12 July, 2019
Test Location	Tokyo Laboratory No.3 EMC test room
Test Engineer	Kazuhiro Nomura, Shoichi Eguchi
Temperature	24 °C
Humidity	54 % RH
Pressure	999 hPa
Power Supply	12 V dc
Operation Mode Name	All Test with Wi-Fi

3.4.1.1 Test Result

Pass

3.4.1.2 Test Detail

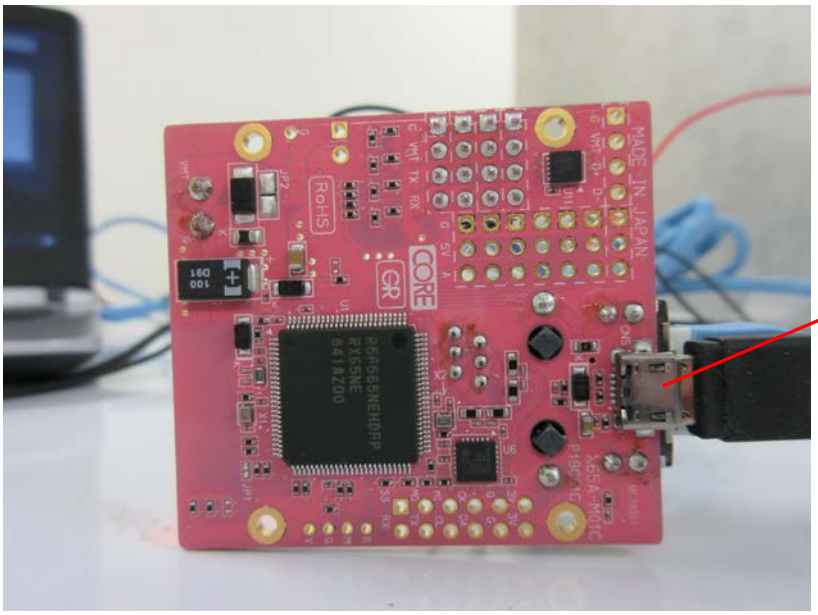
Injection	Test Level	Polarity	Result	Note
Contact Discharge Indirect (HCP)	4 kV	+ / -	A	1
Contact Discharge Indirect (VCP)	4 kV	+ / -	A	
Contact Discharge Direct	4 kV	+ / -	A	2
Air Discharge	-		N/A	3

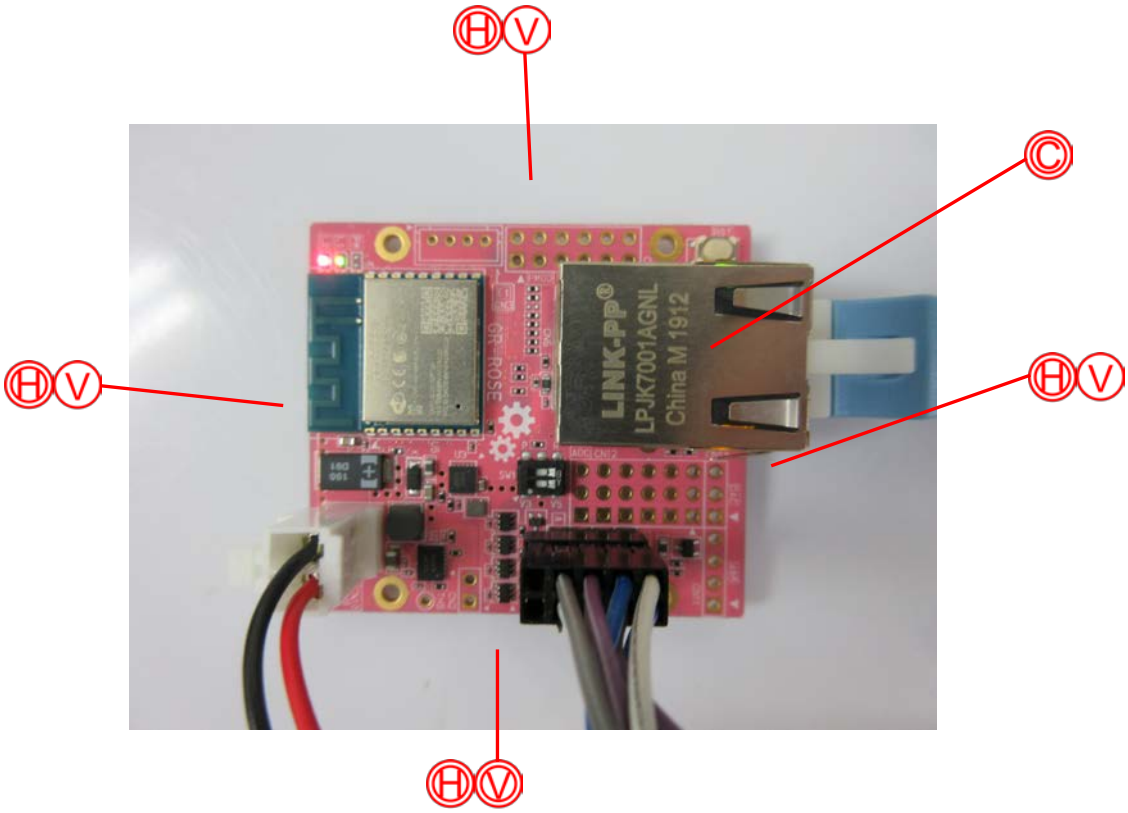
Remarks: Please refer to the photographs showing test points for direct discharge and indirect discharge tests.
The test points were determined by the applicant.
Note:1 Performed indirect discharge using HCP from the 4 directions with bottom surface down.
As the front was not known, 50 discharges were performed on all four sides according to the applicant's request.
Note:2 Static electricity was eliminated for every applied part with using a carbon fiber brush.
Note:3 Air discharge was not included for the test points determined by the applicant.

3.4.2 Test Point

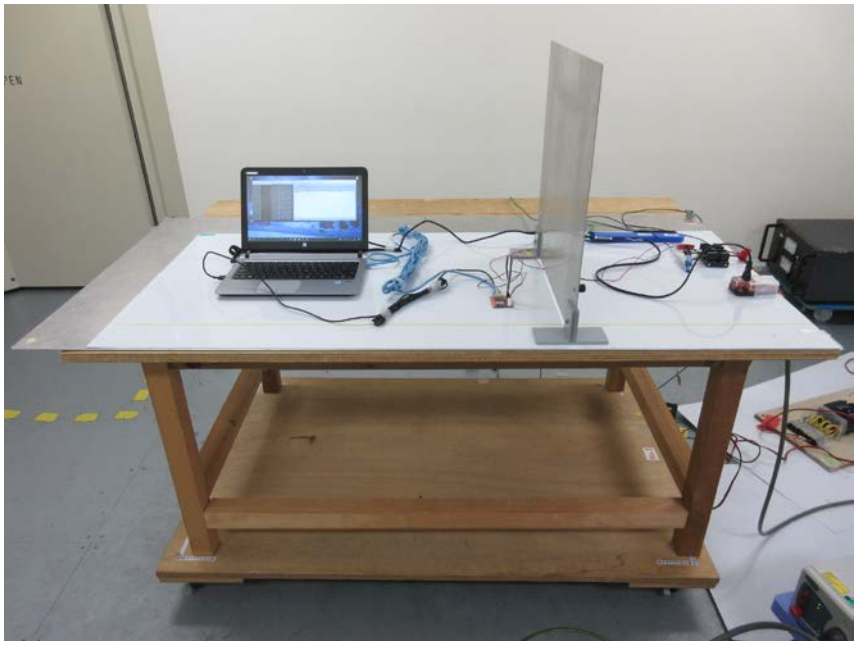
Description of Mark

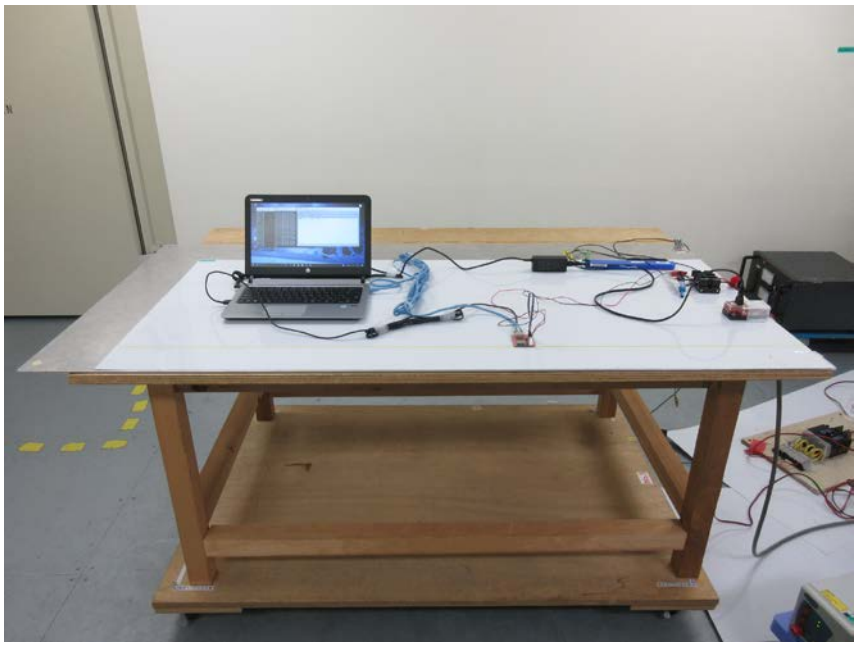
Ⓒ : Contact Discharge (25 times)
Ⓥ : Setting Position of VCP (10 times)
Ⓗ: Setting Position of HCP (25 times)
Ⓥ : Setting Position of VCP (25 times)





3.4.3 Test Setup Photograph(s)





3.5 RF Electromagnetic Field Immunity

3.5.1 Test Specification

Standard	EN55024:2010
Basic Standard	EN61000-4-3:2006+A1:2008+A2:2010
Test Level	3 V/m
Frequency Range	80 MHz to 1 GHz
Modulation	80 % AM (1 kHz)
Sweep Rate	
(Frequency Step)	1 %
(Dwell Time)	3 seconds
Test Surface	Front, Rear, Right, Left
Polarization	Vertical and Horizontal
Performance Criterion	A
Test Date	11 July, 2019
Test Location	Tokyo Laboratory No.1 EMC test room
Test Engineer	Kazuhiro Nomura, Shoichi Eguchi
Temperature	61 °C
Humidity	25 % RH
Pressure	1 005 hPa
Power Supply	12 V dc
Operation Mode Name	All Test with Wi-Fi

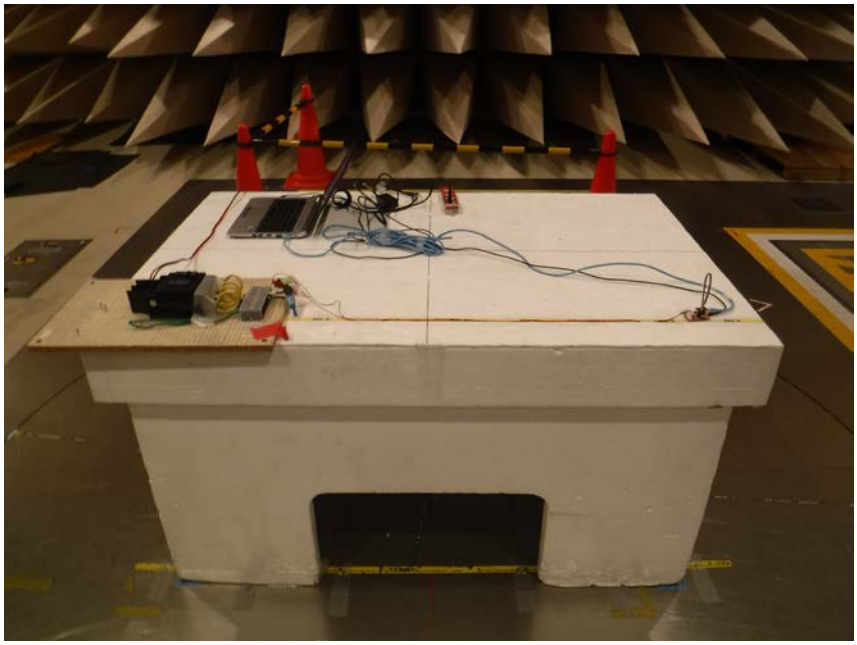
3.5.1.1 Test Result

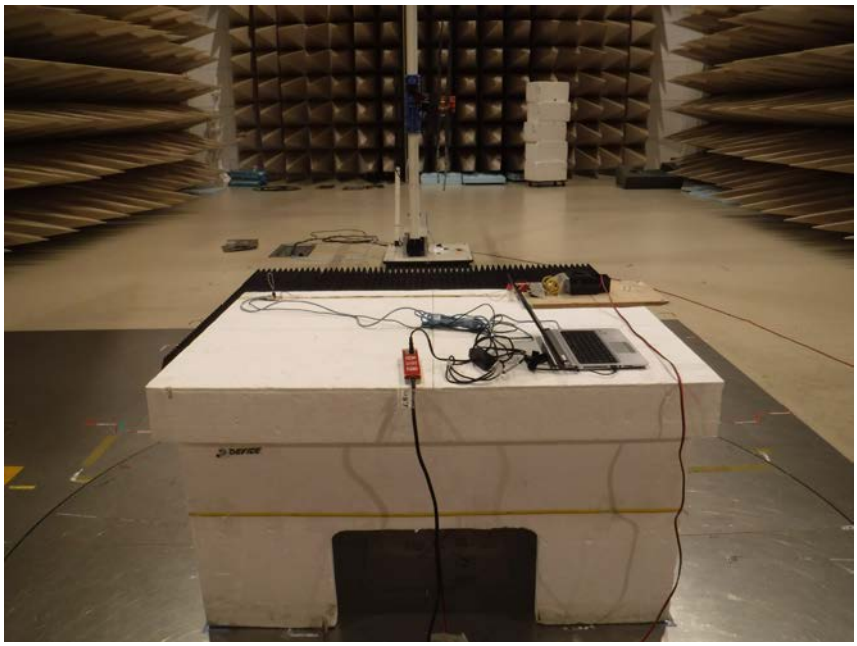
Pass

3.5.1.2 Test Detail

Frequency Range	Test Level	Modulation	Polarization	Surface	Result	Note
80 MHz to 1 GHz	3 V/m	80 % AM (1 kHz)	Vertical and Horizontal	4 sides	A	

3.5.2 Test Setup Photograph(s)





3.6 Electrical Fast Transient/Burst Immunity

3.6.1 Test Specification

Standard	EN55024:2010
Basic Standard	EN61000-4-4:2004
Test Level	0.5 kV (DC Power) 0.5 kV (Signal and telecommunications)
Polarity	Positive and Negative
Repetition Frequency	5 kHz
Test Duration	1 minute
Performance Criterion	B
Test Date	12 July, 2019
Test Location	Tokyo Laboratory No.3 EMC test room
Test Engineer	Kazuhiro Nomura, Shoichi Eguchi
Temperature	24 °C
Humidity	54 % RH
Pressure	999 hPa
Power Supply	12 V dc
Operation Mode Name	All Test with Wi-Fi

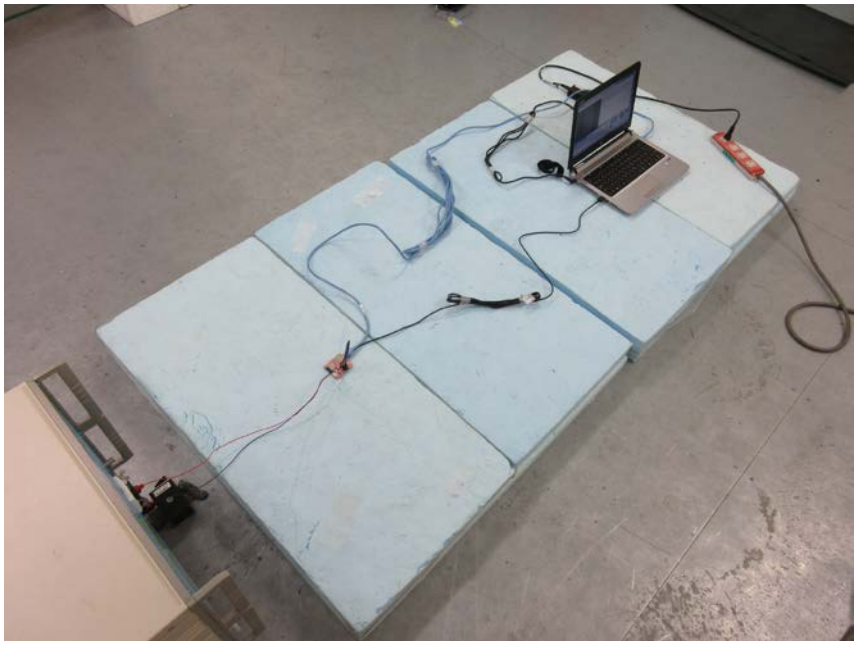
3.6.1.1 Test Result

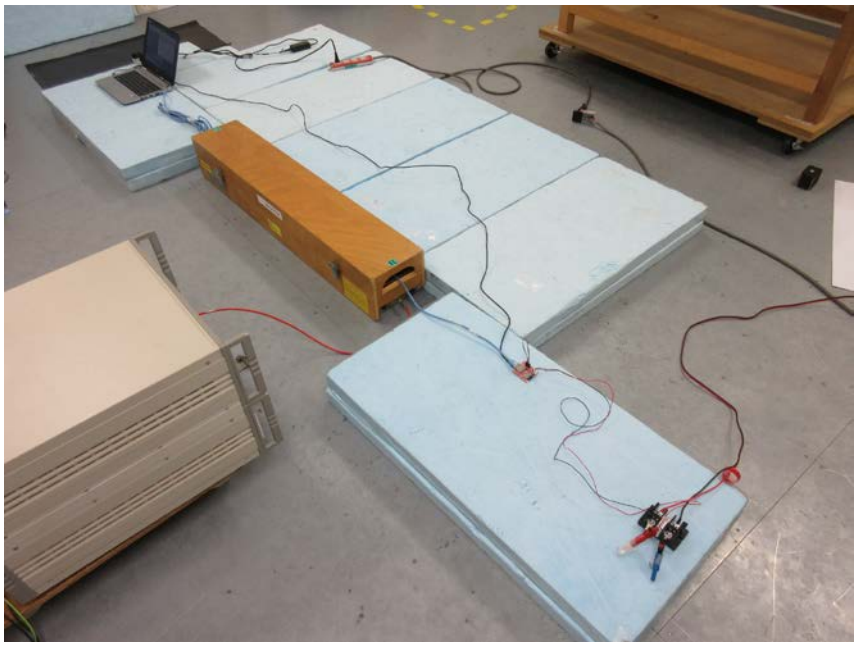
Pass

3.6.1.2 Test Detail

Tested Port	Test Level	Polarity	Coupling	Serial Number	Result	Note
DC Power Cable	0.5 kV	+ / -	CDN	1500	A	
USB Cable	0.5 kV	+ / -	Coupling Clamp	21591	A	
LAN Cable (Mark ③)	0.5 kV	+ / -	Coupling Clamp	21591	A	

3.6.2 Test Setup Photograph(s)





3.7 RF Conducted Immunity

3.7.1 Test Specification

Standard	EN55024:2010
Basic Standard	EN61000-4-6:2009
Test Level	3 V e.m.f.
Frequency Range	150 kHz to 80 MHz
Modulation	80 % AM (1 kHz)
Sweep Rate	
(Frequency Step)	1 %
(Dwell Time)	3 seconds
Performance Criterion	A
Test Date	16 July, 2019
Test Location	Tokyo Laboratory No.1 EMC test room
Test Engineer	Kazuhiro Nomura, Shoichi Eguchi
Temperature	24 °C
Humidity	59 % RH
Pressure	1 003 hPa
Power Supply	12 V dc
Operation Mode Name	All Test with Wi-Fi

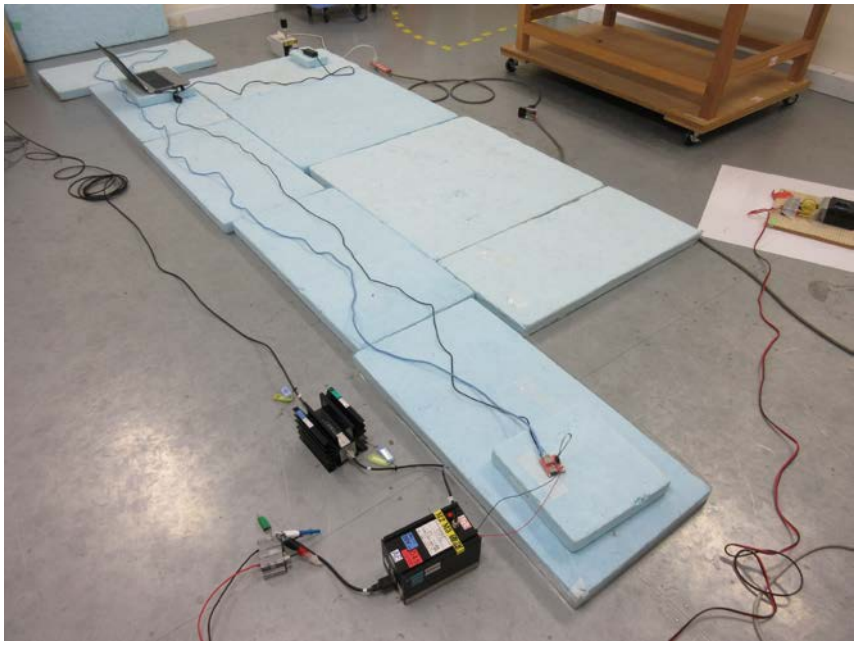
3.7.1.1 Test Result

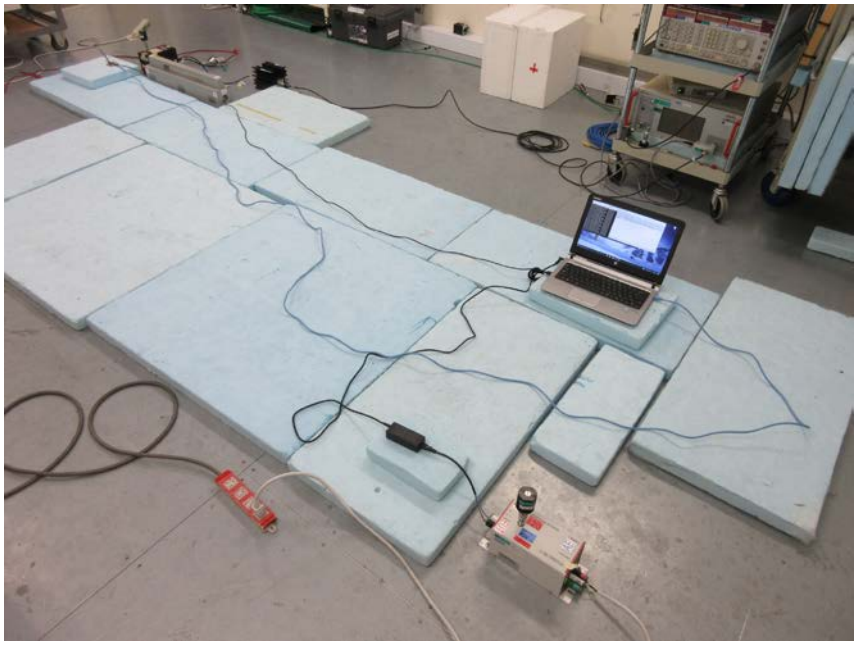
Pass

3.7.1.2 Test Detail

Tested Port	Test Level (e.m.f.)	Injection Device	Serial Number	Result	Note
DC Power Cable	3 V	CDN-M2	2266	A	
USB Cable	3 V	EM Clamp	477	A	
LAN Cable (Mark ③)	3 V	EM Clamp	477	A	

3.7.2 Test Setup Photograph(s)





3.8 Power Frequency Magnetic Field Immunity

3.8.1 Test Specification

Standard	EN55024:2010
Basic Standard	EN61000-4-8:2010
Test Level	1 A/m
Test Frequency	50 Hz, 60 Hz
Test Duration	60 seconds in each axis
Test Field Orientations	3 axis (immersion method)
Performance Criterion	A
Test Date	11 July, 2019
Test Location	Tokyo Laboratory No.1 EMC test room
Test Engineer	Kazuhiro Nomura, Shoichi Eguchi
Temperature	61 °C
Humidity	25 % RH
Pressure	1 005 hPa
Power Supply	12 V dc
Operation Mode Name	All Test with Wi-Fi

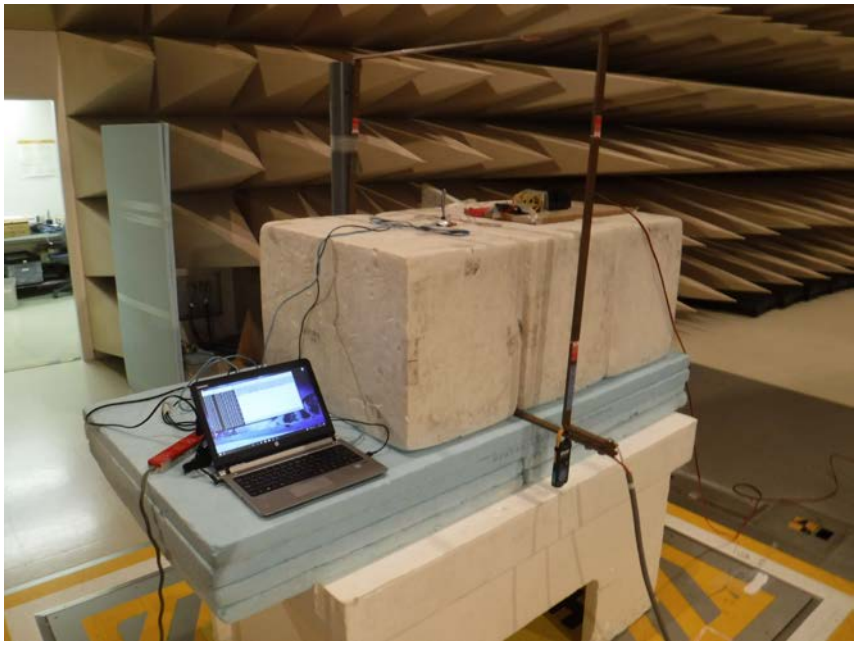
3.8.1.1 Test Result

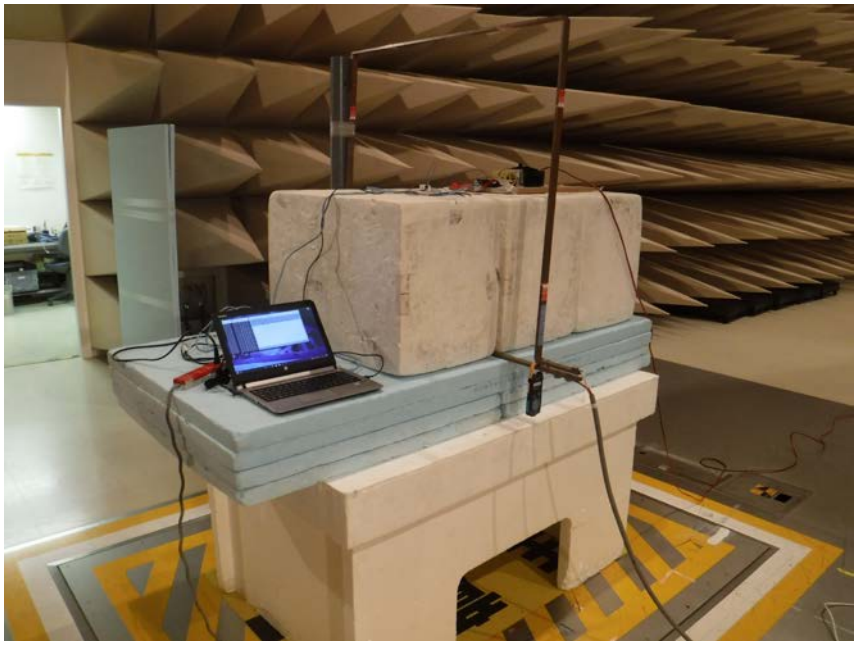
Pass

3.8.1.2 Test Detail

Frequency	Test Level	Axis	Result	Note
50 Hz	1 A/m	X, Y, Z	A	
60 Hz	1 A/m	X, Y, Z	A	

3.8.2 Test Setup Photograph(s)





4. Test facility

4.1 Test Instruments

4.1.1 Conducted Emissions

Product Name	Manufacturer	Model Number	Serial Number	Calibration Date	Due Date
Receiver	Rohde&Schwarz	ESIB7	100211	2018/7/23	2019/7/31
LISN	Rohde&Schwarz	ESH2-Z5	100383	2018/10/11	2019/10/31
LISN	Rohde&Schwarz	ENV216/12	101536	2018/7/20	2019/7/31
8-Wire ISN	TESEQ	ISN T8	27949	2018/9/11	2019/9/30
RF Selector	Toyo	NS4900 (No3 RF Switch System)	0808-243	2019/3/20	2020/3/31
Software	e-OHTAMA, LTD.	emission measurement program	toemc02-1.5	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	2018/10/15	2019/10/31
Receiver	Rohde&Schwarz	ESVS30	842807/010	2019/5/21	2020/5/31
Receiver	Rohde&Schwarz	ESU26	100218	2018/8/24	2019/8/31
Pre-Amplifier	Hewlett Packard	8447D	2944A07182	2019/3/22	2020/3/31
Pre-Amplifier	Hewlett Packard	8449B	3008A0079	2018/7/24	2019/7/31
Attenuator (6 dB)	Suhner	6806.17.B	1	2019/3/22	2020/3/31
Horn Antenna	ETS LINDGREN	3115	6554	2018/12/19	2019/12/31
Trilog Antenna	Schwarzbeck	VULB9160	9160-3189	2018/11/28	2019/11/30
RF Relay Matrix Unit	DAI-ICHI DENPA KOGYO	CX310N+CX-210N (No1 RF Switch System)	None	2019/3/22	2020/3/31
Software	e-OHTAMA, LTD.	emission measurement program	toemc02-1.5	N/A	N/A

4.1.3 Electrostatic Discharge Immunity

Product Name	Manufacturer	Model Number	Serial Number	Calibration Date	Due Date
ESD Simulator	Schaffner	NSG438	421	2019/6/20	2020/6/31

4.1.4 RF Electromagnetic Field Immunity

Product Name	Manufacturer	Model Number	Serial Number	Calibration Date	Due Date
Signal Generator	Rohde&Schwarz	SML03	103035	2018/10/9	2019/10/31
Power Meter	Agilent	E4417A	MY45101135	2019/3/15	2020/3/31
Power Sensor	Agilent	E9321A	US40390241	2019/3/15	2020/3/31
Power Sensor	Agilent	E9321A	US40390274	2019/3/15	2020/3/31
Directional Coupler	Werlatone	C3908-20	109147	2019/2/12	2020/2/29
Amplifier	Amplifier Research	1000W1000EM1	0344921	2019/3/4	2020/3/31
Antenna	Amplifier Research	ATR80M6G	0339059	2019/3/4	2020/3/31
Software	Toyo Corporation	IM5RS	Ver.5.2.4	N/A	N/A

4.1.5 Electrical Fast Transient/Burst Immunity

Product Name	Manufacturer	Model Number	Serial Number	Calibration Date	Due Date
Capacitive Coupling Clamp	Schaffner	CDN8014	21591	2019/3/29	2020/3/31
EMC Tester (Burst)	EMC PARTNER	TRA2006	1500	2019/3/27	2020/3/31

4.1.6 RF Conducted Immunity

Product Name	Manufacturer	Model Number	Serial Number	Calibration Date	Due Date
Signal Generator	Rohde&Schwarz	SMHU	833370/017	2018/10/24	2019/10/31
Power Meter	Rohde&Schwarz	NRVS	839187004	2019/5/23	2020/5/31
Insertion Unit	Rohde&Schwarz	URV5-Z4	839756/56	2019/5/23	2020/5/31
Amplifier	TESEQ	CBA400M-110	T44611	2019/5/10	2020/5/31
Attenuator (6 dB)	TAMAGAWA	CFA-100ANJJ-6	229029	2018/10/9	2019/10/31
CDN	Luthi	L801-M2/M3	2266	2018/10/3	2019/10/31
CDN	TESEQ	CDN M016	49342	2019/3/18	2020/3/31
EM Clamp	TSJ	TSIC-32	477	2019/5/10	2020/5/31
Software	TSJ	TEPTO-RS/BCI	Ver.4.8.29	N/A	N/A

4.1.7 Power Frequency Magnetic Field Immunity

Product Name	Manufacturer	Model Number	Serial Number	Calibration Date	Due Date
Transformer	UNION ELECTRIC CO.,LTD.	MD-S-P1023-0.5V200A	None	N/A	N/A
Ammeter	HIOKI	3280-20	050533702	2019/3/20	2020/3/31
Magnetic Field Coil	e-OHTAMA	1m x 1m Ref 400A	400	2019/5/17	2020/5/31

4.2 Test equipment

Dimension	Material	Measurement
1.5 m (W) X 0.8 m (H) X 1.0 m (D)	polystyrene	Radiated Electric-Field Emissions

4.3 Normalized Site Attenuation

Site Name	Laboratory	Calibration Date	Due Date
No.1 EMC test room	Tokyo Laboratory	2019/1/18	2020/1/31

Annex A (Miscellaneous Information)

This annex may include contents not related to this report.

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*** U_{lab} *(k = 2)*
Conducted Disturbance: LISN (150 kHz - 30 MHz)	3.4dB
Conducted Disturbance: Voltage Probe (150 kHz - 30 MHz)	2.8dB
Conducted Disturbance: ISN (150 kHz - 30 MHz)	5.0dB
Conducted Disturbance: CVP (150 kHz - 30 MHz)	2.9dB
Conducted Disturbance: Current Probe (150 kHz - 30 MHz)	2.9dB
Disturbance Power (30 MHz - 300 MHz)	2.9dB
Radiated Disturbance (30 MHz - 1 GHz)	4.7dB
Radiated Disturbance (1 GHz - 6 GHz, CISPR 16-2-3)	4.9dB
Radiated Disturbance (1 GHz - 18 GHz, ANSI C63.4)	5.7dB
Radiated Disturbance (150 kHz - 30 MHz)	3.3dB
Conducted Antenna Power (47 CFR 15; 30 - 1 GHz)	2.8dB
Mains Harmonics Current (IEC 61000-3-2, -3-12)	8.5%
Flicker (IEC 61000-3-3, -3-11)	13%

Immunities

For immunity tests for which the standard specifies limits to the values of the major sources of uncertainty, we considered to have satisfied the requirements regarding uncertainty by following the standard.

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)

This annex may include contents not related to this report.

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 C63.4-2014 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 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 dBµV + 0.5 dB + 10.5 dB = 44.0 dBµV.
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 C63.4-2014 is to be used for EUT arrangements and operations, and section 7 of the standard is to be used for radiated emissions measurement procedures.

B.2 Conducted Emissions (Telecommunications)

EUT is arranged in the same manner as the conducted emissions measurement for mains ports.
If ISN is applicable for the telecommunication port under test, the port would be connected to the auxiliary equipment through an appropriate ISN. If the cable is shielded and ISN is not applicable, a current probe would be applied to the cable connecting the port and the auxiliary equipment, and a CDN as specified in IEC 61000-4-6 or a 150 ohms termination resistor would be connected between the cable and the ground plane.
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 (ISN 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 dBµV + 0.5 dB + 10.5 dB = 44.0 dBµV.
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 22 and/or other standards whichever applicable.

B.3 Radiated Electric-Field Emissions (Below 1 GHz)

EUT is placed on a turn-table in a test site, on a 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 receive 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 C63.4-2014 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.4 Radiated Electric-Field Emissions (Above 1 GHz)

EUT is placed on a turn-table in a test site, on a 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 C63.4-2014 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.5 Radiated Magnetic-Field Emissions

EUT is placed on a turn-table in a test site, on a table 0.8 m height or on the floor unless otherwise specified in the standard.
Receiving antenna ---loop antenna (active or passive) --- is positioned at the specified distance from the EUT.
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 rotating the receiving antenna about its center, 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, and transmission loss (cable loss) in the system--- is applied to the receiver reading to calculate the corresponding field strength, and the result is compared with the upper limit specified in the standard.
In general, it is assumed that magnetic field strength can be converted to electric field strength by applying the free space impedance of approximately 377 ohms, and vice versa.
Actual measurement will be carried out according to the appropriate edition of CISPR 16-2-3, ANSI C63.4 and/or other standards whichever applicable.

B.6 Disturbance Power

Table-top EUT is placed on a table of 0.8 m height, and floor-standing EUT is placed on the floor.
The lead under test (LUT) of the EUT is placed on the cable slide at 0.8 m from the floor, and the absorbing clamp is placed around the LUT.
Other leads connected to the EUT, if any, are removed or fitted with ferrite clamp(s) whenever possible.
A spectrum analyzer is used to pre-scan the emissions while scanning the absorbing clamp along the LUT.
For each of the significant emissions detected, the maximum signal level is searched while scanning the absorbing clamp along the LUT, and the maximum signal level is read using a measuring receiver having CISPR 16 quasi-peak (QP) and average (AV) detector function and 120 kHz nominal bandwidth.
Then, appropriate correction factor ---consists of transducer (absorbing clamp) factor and transmission loss (cable loss) in the system--- is applied to the receiver reading to calculate the corresponding emission level, 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 14-1, CISPR 16-2-2 and/or other standards whichever applicable.

B.7 Harmonic Current Emissions

Mains to the EUT is supplied from a regulating power supply unit, and the harmonic current is analyzed using a power analyzer complying with IEC 61000-4-7.
Test observation period are to be decided as specified in the standard.
If specific test conditions are specified in the applicable standard, the measurements are conducted with the condition as specified in the standard.
Otherwise, the measurements are conducted with the mode expected to produce the maximum total harmonics current under normal operating conditions.
Actual measurement will be carried out according to the appropriate edition of IEC/EN 61000-3-2, JIS C 61000-3-2 and/or other standards whichever applicable.

B.8 Voltage fluctuations and Flickers

Mains to the EUT is supplied from a regulating power supply unit and through the reference impedance as specified in the standard, and the voltage change is analyzed using a flicker meter complying with the standard.
If specific test conditions are specified in the applicable standard, the measurements are conducted with the condition as specified in the standard.
Otherwise, the measurements are conducted with the mode expected to produce the maximum voltage fluctuation under normal operating conditions.
First, the voltage fluctuation is observed for ten minutes with the mode expected to produce the maximum voltage fluctuation, and the voltage fluctuations and the short-term flicker indicator Pst are measured by the flicker meter.
Measurement for the long-term flicker indicator Plt which usually require two hours may also be required, but the measurement may be omitted if the value of Pst was well below the limit for Plt.
Some types of EUT may require additional measurements for dmax caused by manual switching's.
Actual measurement will be carried out according to the appropriate edition of IEC/EN 61000-3-3 and/or other standards whichever applicable.

B.9 Electrostatic Discharge Immunity

Table-top EUT is placed on a horizontal coupling plane (HCP), insulated from the HCP with a thin insulating sheet.
The HCP is placed on a table of 0.8 m height, and the HCP is connected to the ground plane via a cable with a 470 k ohms resistor located at each end.
Floor-standing EUT is placed on the ground plane, insulated from the ground plane with an insulating support about 0.1 m thick.
Unless otherwise specified in the standards, direct discharges are applied to the points and surfaces which are accessible during normal operation.
For conductive points and surfaces, contact discharges are applied by making the sharp discharge tip of the ESD generator touched with the test points and then operating the discharge switch of the generator.
For non-conductive points and surfaces, air discharges are applied by making the round discharge tip of the ESD generator approached to touch the EUT after operating the discharge switch of the generator.
Discharges would also be applied to the vertical coupling plane (VCP), placed parallel to, and positioned at a distance of 0.1 m from, the EUT.
The VCP is a metal sheet of dimensions 0.5 m x 0.5 m, and is connected to the ground plane in the same manner as the HCP.
For table-top EUT, discharges would also be applied to the HCP under the EUT.
Actual test will be carried out according to the appropriate edition of IEC/EN 61000-4-2 and/or other standards whichever applicable.

B.10 RF Electromagnetic Field Immunity

Table-top EUT is placed on a table of 0.8 m height, and floor-standing EUT is placed, as far as possible, on an insulating support about 10 cm thick on the floor.
The EUT is initially placed in front of a field generating antenna, with its one face coincident with the plane where the field strength of the disturbance was calibrated.
The EUT and the cables are then illuminated by the electromagnetic field of the required frequency, modulation and field strength, by injecting the power obtained from the calibration data into the field generating antenna.
The frequency ranges to be considered are swept with the step size not exceeding 1% of the preceding frequency, and with the dwell time no shorter than the value specified in the standard or by the applicant.
The tests are repeated to illuminate the faces to be tested (usually four or six faces of the EUT) to both horizontal and vertical polarizations, one by one.
Actual test will be carried out according to the appropriate edition of IEC/EN 61000-4-3 and/or other standards whichever applicable.

B.11 Electrical Fast Transient/Burst Immunity

EUT is placed on an insulating support of about 0.1 m or 0.8 m, as specified in the applicable standard, on a ground plane.
To inject the disturbance to the mains, mains to the EUT is supplied through a CDN and the disturbance voltage is applied between the ground plane and the power supply conductors (including N and PE, if any) either by one by one or by simultaneously depends to the applied standard.
Cables other than the mains are tested using a capacitive coupling clamp.
If capacitive coupling clamp is not appropriate, other methods specified in the standard may be used instead.
Actual test will be carried out according to the appropriate edition of IEC/EN 61000-4-4 and/or other standards whichever applicable.
Unless otherwise described,
Disturbances were applied to the cables in the order they are listed in the ``Test Data'' section(s) of this report.

B.12 Surge Immunity

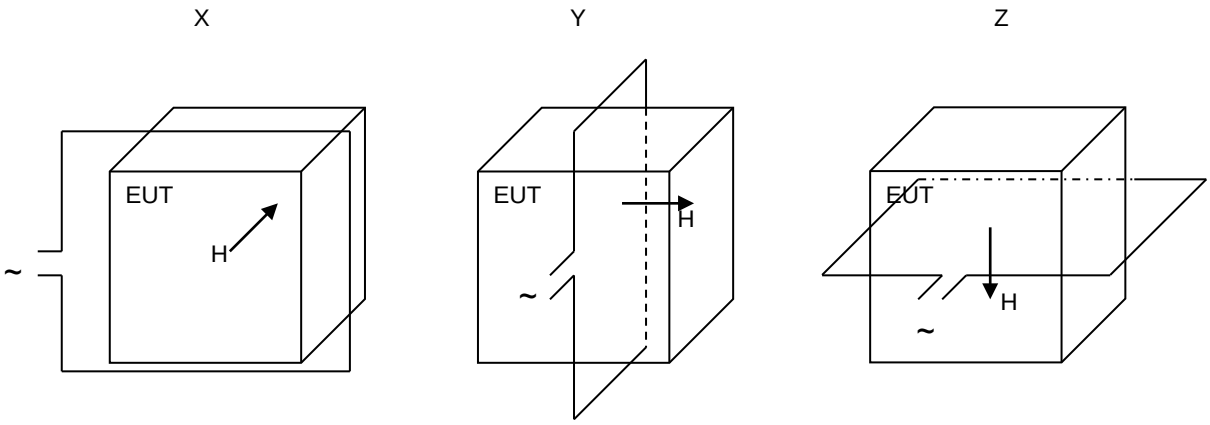
If CDN is applicable, the disturbance is applied between each combination of the conductors (line-to-line) and/or between each of the conductors and the ground plane (line-to-ground).
If CDN is not applicable, other methods specified in the standard may be used instead.
Actual test will be carried out according to the appropriate edition of IEC/EN 61000-4-5 and/or other standards whichever applicable.
Unless otherwise described, disturbances were applied to the cables in the order they are listed in the ``Test Data'' section(s) of this report, and from lower voltage to higher voltage when multiple voltages were applied to a cable.

B.13 RF Conducted Immunity

EUT is placed on an insulating support of about 0.1 m on a ground plane.
If CDN is applicable, the disturbance is to be injected to the cable using a suitable CDN.
If CDN is not applicable, the disturbance will be injected using a EM clamp or a current clamp, but the other end of the cable must also be prepared appropriately as specified in the standard.
Other cables to the EUT are disconnected or attached with CDNs whenever possible. Either all the CDNs or one of the CDNs are terminated with 50 ohms termination resistor as specified in the standard.
The cables are subjected to the disturbance of the required frequency, strength and modulation, by injecting the power obtained from the calibration data into the injection devices.
The frequency ranges to be considered are swept with the step size not exceeding 1% of the preceding frequency, and with the dwell time no shorter than the value specified in the standard or by the applicant.
Actual test will be carried out according to the appropriate edition of IEC/EN 61000-4-6 and/or other standards whichever applicable.

B.14 Power Frequency Magnetic Field Immunity

EUT is placed in an induction coil so that it is contained in the testing volume of the induction coil.
The induction coil is then excited with low frequency current of the magnitude required to generate the required magnetic field strength.
To test the EUT in three orthogonal axes, the induction coil is then rotated and the test is repeated.
Actual test will be carried out according to the appropriate edition of IEC/EN 61000-4-8 and/or other standards whichever applicable.



B.15 Voltage Dips, Short Interruptions Immunity

Mains cable of EUT is connected to a test generator and normal supply voltage is supplied to the EUT.
Then, the test generator causes required voltage changes in its output to test the EUT.
Actual test will be carried out according to the appropriate edition of IEC/EN 61000-4-11 and/or other standards whichever applicable.