

## Report on the EMC Testing of:

**CORE CORPORATION**  
**GR-LYCHEE, Model: X50A-M01**

**In accordance with**  
**ETSI EN 301 489-1, ETSI EN 301 489-17**

Prepared for: **CORE CORPORATION**  
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Japan

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**Inspire trust.**

## COMMERCIAL-IN-CONFIDENCE

Document Number: JPX-TR-19207-0

### SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Eiji Akiba	EMC Lab Manager	Approved Signatory	19 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 ETSI EN 301 489-1, ETSI EN 301 489-17 (excluding the deviations mentioned in section 1.4 of this document).



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## 1 Summary of Test

### 1.1 Modification history of the test report

Document Number	Modification History	Issue Date
JPX-TR-19207-0	First Issue	Refer to the cover page

### 1.2 Standards

ETSI EN 301 489-1 V2.1.1 (2017-02)  
ETSI EN 301 489-17 V3.1.1 (2017-02)

### 1.3 Normative references

EN 61000-4-2:2009  
EN 61000-4-3:2006 + Amendment 1:2008 + Amendment 2:2010  
EN 61000-4-4:2012  
EN 61000-4-6:2014

### 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.

### 1.5 Symbol of Test Item

RE: Radiated emission  
ESD: Electrostatic discharge immunity  
RS: Radio-frequency electromagnetic field immunity  
Burst: Electrical fast transient/ burst immunity  
CS: Conducted disturbances, inducted by radio-frequency field immunity

### 1.6 Test period

04-June-2019 - 10-June-2019

## 1.7 Test information

### Exclusion bands

#### EN 301 489-17

The frequencies on which the transmitter part of the EUT is intended to operate shall be excluded from radiated emission measurements when performed in transmit mode of operation.

There shall be no frequency exclusion band applied to emission measurements of the receiver part of transceivers or the stand alone receiver under test, and/or associated ancillary equipment.

The exclusion band for immunity testing of equipment operating in the 2,4 GHz band shall be:

- lower limit of exclusion band = lowest allocated band edge frequency -120 MHz, i.e. 2 280 MHz;
- upper limit of exclusion band = highest allocated band edge frequency +120 MHz, i.e. 2 603,5 MHz.

The exclusion band for immunity testing of equipment operating in the 5 GHz Wi-Fi band shall be:

- lower limit of exclusion band = lowest allocated band edge frequency -270 MHz, i.e. 4 880 MHz;
- upper limit of exclusion band = highest allocated band edge frequency +270 MHz, i.e. 5 995 MHz.

The exclusion band for immunity testing of equipment operating in the 5.8 GHz band shall be:

- lower limit of exclusion band = lowest allocated band edge frequency -270 MHz, i.e. 5 455 MHz;
- as the immunity requirement operating have an upper frequency range of 6 GHz and any upper edge exclusion band would be greater than this for the 5.8 GHz band. The above frequency shall also be regarded as the upper end of the test range.

NOTE: These receiver exclusion band ranges align with the relevant blocking test ranges.

This equipment uses 2.4 GHz band.

Therefore, the exclusion bands under test are as follows for each band.

2.4 GHz band : From 2280 MHz to 2603.5 MHz

### Electrostatic discharge immunity

As users cannot touch the circuit board while the EUT is operating, Electrostatic discharge immunity test was performed based on the points designated by the applicant.

## 1.8 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	Class B	Not applied	N/A	N/A	*1
Conducted emission at telecommunication port	Class B	Not applied	N/A	N/A	*2
Radiated emission (below 1 GHz)	Class B	Applied	Pass	V 120.000 MHz QP 3.3 dB	-
Radiated emission (above 1 GHz)	Class B	Applied	Pass	V 4824.003 MHz PK 5.4 dB	-

### Harmonic current emission

Test Name	Class	Test	Result	Remark
Harmonic current emissions	-	Not applied	-	*1

### Voltage changes, voltage fluctuation and flicker

Test Name	Test	Result	Remark
Voltage change, voltage fluctuation and flicker	Not applied	-	*1

### Immunity of enclosure

Test Name	Performance criterion	Test	Result	Remark
Electrostatic discharge immunity	B	Applied	Pass	-
Radio-frequency electromagnetic field immunity	A	Applied	Pass	-

### Immunity of AC power

Test Name	Performance criterion	Test	Result	Remark
Electrical fast transient/ burst immunity	-	Not applied	-	*3
Surges immunity	--	Not applied	-	*3
Conducted disturbances, induced by radio-frequency field immunity	A	Not applied	-	*3
Voltage dips, short interruption and voltage variations immunity	-	Not applied	-	*3

### Immunity of DC power

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

### Immunity of signal ports and telecommunication ports

Test Name	Performance criterion	Test	Result	Remark
Electrical fast transient/ burst immunity	B	Applied	Pass	-
Surges immunity	-	Not applied	-	*3
Conducted disturbances, induced by radio-frequency field immunity	A	Applied	Pass	-

\*1: The EUT has no AC power port. The DC power port cannot be connected to a vehicle, cable length is 3 m or less, and the EUT does not have a dedicated AC/DC power source. Therefore, test is not applied.

\*2: Conducted emission at telecommunication port is not applied because the EUT has no telecommunication port.

\*3: Test is not applied because the EUT has no relevant ports.

## 1.9 Test setup

Table-top

**1.10 Performance criteria**

criteria	During test	After test
<b>A</b>	Shall operate as intended. Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
<b>B</b>	May show loss of function (one or more). May show degradation of performance. Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance. Shall be no loss of stored data or user programmable functions.
<b>C</b>	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance.

**1.11 Monitoring of EUT**

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

**1.12 Test Plan**

All the tests in this test report are performed according to test plan number: JPX-TP-19208-0

**1.13 Deviation from the Test Plan**

None

## 2 Equipment Under Test

### 2.1 EUT information

Applicant	CORE CORPORATION 11-1 Minami-Kurokawa, Asao-ku, Kawasaki-shi, Kanagawa, 215-0034 Japan Phone: +81-44-989-5128 Fax: +81-44-989-5133
Equipment Under Test (EUT)	GR-LYCHEE
Model number	X50A-M01
Serial number	M001, M002
Trade name	CORE
Number of sample(s)	2
EUT condition	Mass production
Maximum frequency	384 MHz
Power rating	DC 5.0 V 0.5 A
Size	(W) 67.58 × (D) 53.34 × (H) 8.6 mm
[RF Specification]	
RF type	: Bluetooth v4.2 BR/EDR and BLE
Frequency Range	: 2402 MHz – 2480 MHz
RF type	: IEEE 8.2.11b, IEEE 8.2.11g, IEEE 8.2.11n
Frequency Range	: 2412 MHz – 2485 MHz

### 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
X50A-M01, S/N: M001			
0	As supplied by the applicant	Not Applicable	Not Applicable
X50A-M01, S/N: M002			
0	As supplied by the applicant	Not Applicable	Not Applicable



Japan

## **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**

1. Continuous transmission & reception mode

i) Power ON

ii) Bluetooth link establishment between EUT and the PC, Operation

iii) WiFi link establishment between EUT and the PC, Operation

2. Stand-by mode

i) Power ON

ii) Bluetooth link Standby

iii) WiFi link Standby

### 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”.

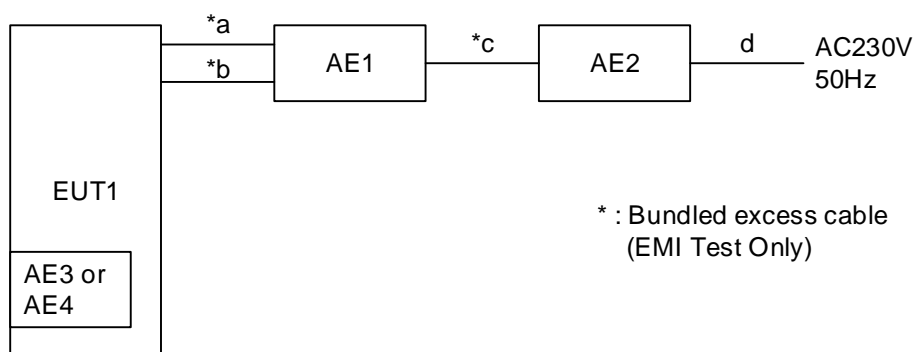
#### 3.1 Equipment used

No.	Equipment	Company	Model No.	Serial No.	Remarks
EUT1	GR-LYCHEE	CORE CORPORATION	X50A-M01	M001 M002	EUT
AE1	Personal Computer	HP	HSTNN-Q98C	JPH803XLHS	-
AE2	AC Adapter	HP	HSTNN-CA41	N/A	-
AE3	SD Card	A-DATA	Speedy (2GB)	G02GNMZ 6B0001	-
AE4	SD Card	HAGIWARA SYS-COM	HINT-MN32MA(32MB)	N/A	-

#### 3.2 Cable(s) used

No.	Cable	Length (m)	Shield	EUT accessory Ferrite core	Remarks
a	USB cable	3.0	Yes	-	-
b	USB cable	3.0	Yes	-	-
c	DC cable	1.8	No	-	-
d	AC power cord	1.0	No	-	-

#### 3.3 System configuration



Unit 1: EMI Test	--- EUT1(S/N: M001) + AE3_SD Card(A-DATA)
Unit 1: EMS Test (RS)	--- EUT1(S/N: M001) + AE3_SC Card(A-DATA)
Unit 2: EMS Test (CS)	--- EUT1(S/N: M002) + AE3_SC Card(A-DATA)
Unit 3: EMS Test (Burst)	--- EUT1(S/N: M002) + AE4_SC Card(HAGIWARA)
Unit 2: EMS Test (ESD)	--- EUT1(S/N: M002) + AE3_SC Card(A-DATA)

## 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 x (D) 1.0 x (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

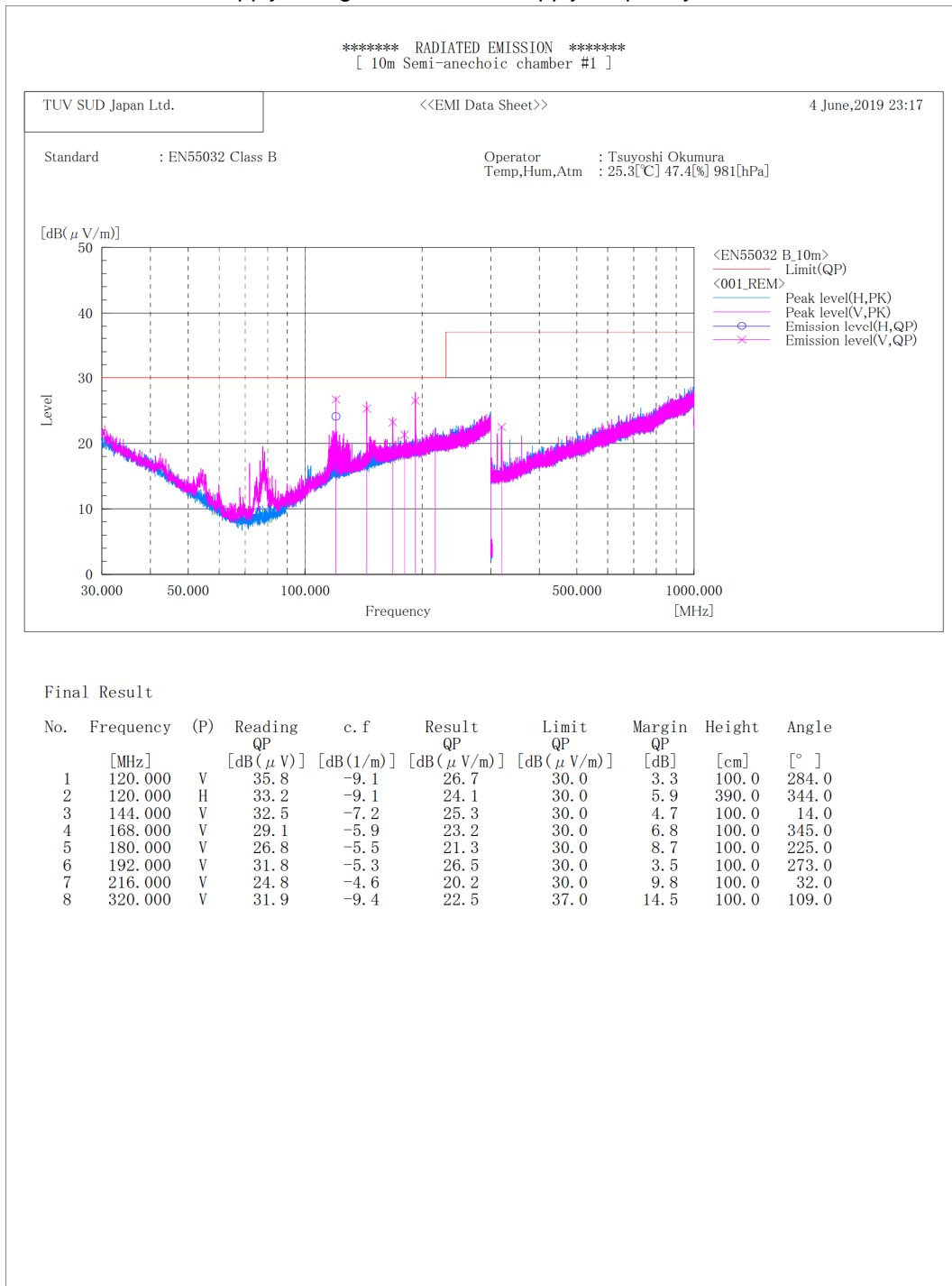
Emission level = 41.1 - 11.8 = 29.3 dBμV/m

Margin = 37.0 - 29.3 = 7.7 dB

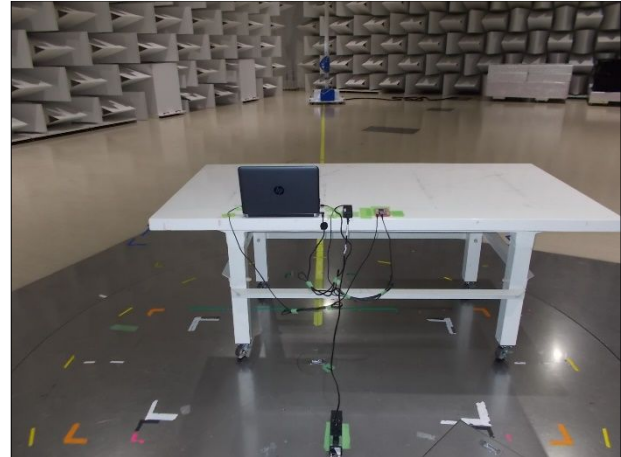
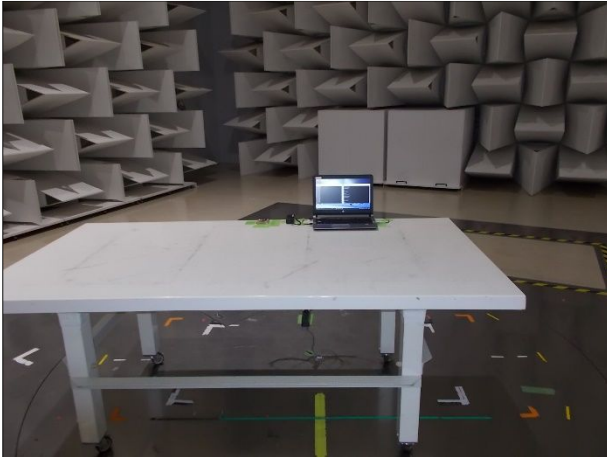
#### 4.1.3 Test data and Configuration photographs

Operation mode	Continuous transmission & reception mode
EUT	X50A-M01, S/N: M001 - Modification State 0

Date of test: 04-June-2019 Supply voltage: AC 230 V Supply frequency: 50 Hz



Radiated emission (below 1 GHz)	Continuous transmission & reception mode
The photographs show maximized emission configuration.	



## 4.2 Radiated emission (above 1 GHz)

### 4.2.1 Measurement condition

EUT is placed on a styrene form table for table-top equipment or on insulation material for a floor-standing equipment. The styrene form 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.

Absorbers are placed between the EUT and an antenna.

The antenna is varied its polarization (horizontal and vertical) and its height is set in accordance with beamwidth of the antenna used. 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.

The antenna is positioned from the test volume that was predetermined by the site VSWR measurement. Since this predetermined test volume is different from maximum circumference where the EUT and the peripheral devices are actually placed, the measurement distance conversion factor is added to the measurement data.

Items	Description
Frequency range	1000 MHz-6000 MHz
Test place	10 m Semi-Anechoic Chamber No. 2
EUT was placed on	Styrene foam table (W) 2.0 × (D) 1.0 × (H) 0.8 m
Axis	0°-360°
Antenna	Distance from EUT: 4.30 m Height: 1 m (fixed) Polarity: Horizontal/Vertical
Test receiver setting	Detector: Peak, Average Bandwidth: 1 MHz

Antenna 3 dB beamwidth (antenna used: 3117)

Antenna: 3115

Frequency (GHz)	θ3 dB (°)	3 dB beamwidth w (m)
1.0	63	3.68
2.0	47	2.61
3.0	38	2.07
4.0	36	1.95
5.0	40	2.18
6.0	44	2.42

Antenna: 3117

Frequency (GHz)	θ3 dB (°)	3 dB beamwidth w (m)
1.0	82	5.22
2.0	60	3.46
3.0	76	4.69
4.0	56	3.19
5.0	54	3.06
6.0	50	2.80

Measurement distance:  $d = 3.0$  m

$W = 2 \times d \times \tan(0.5 \times \theta_{3\text{ dB}})$

#### 4.2.2 Calculation method

Emission level = Reading + Measurement distance conversion factor + c.f. (correction factor)\*

Margin = Limit - Emission level

\*Note: c.f. = Antenna factor + Cable system loss + Attenuator loss - Amplifier Gain

Example)

Limit @ 1100.0 MHz: 70.0 dB $\mu$ V/m (Peak)  
50.0 dB $\mu$ V/m (Average)

Measurement distance: 3.25 m

Measurement distance conversion factor:  $20 \log (3.25\text{m}/3.0\text{m}) = 0.7 \text{ dB}$

Peak                      Reading = 50.2 dB $\mu$ V, Measurement distance conversion factor = 0.7 dB,  
c.f. = 1.7 dB/m

Emission level =  $50.2 + 0.7 + 1.7 = 52.6 \text{ dB}\mu\text{V/m}$

Margin =  $70.0 - 52.6 = 17.4 \text{ dB}$

Average                Reading = 32.0 dB $\mu$ V, Measurement distance conversion factor = 0.7 dB,  
c.f. = 1.7 dB/m

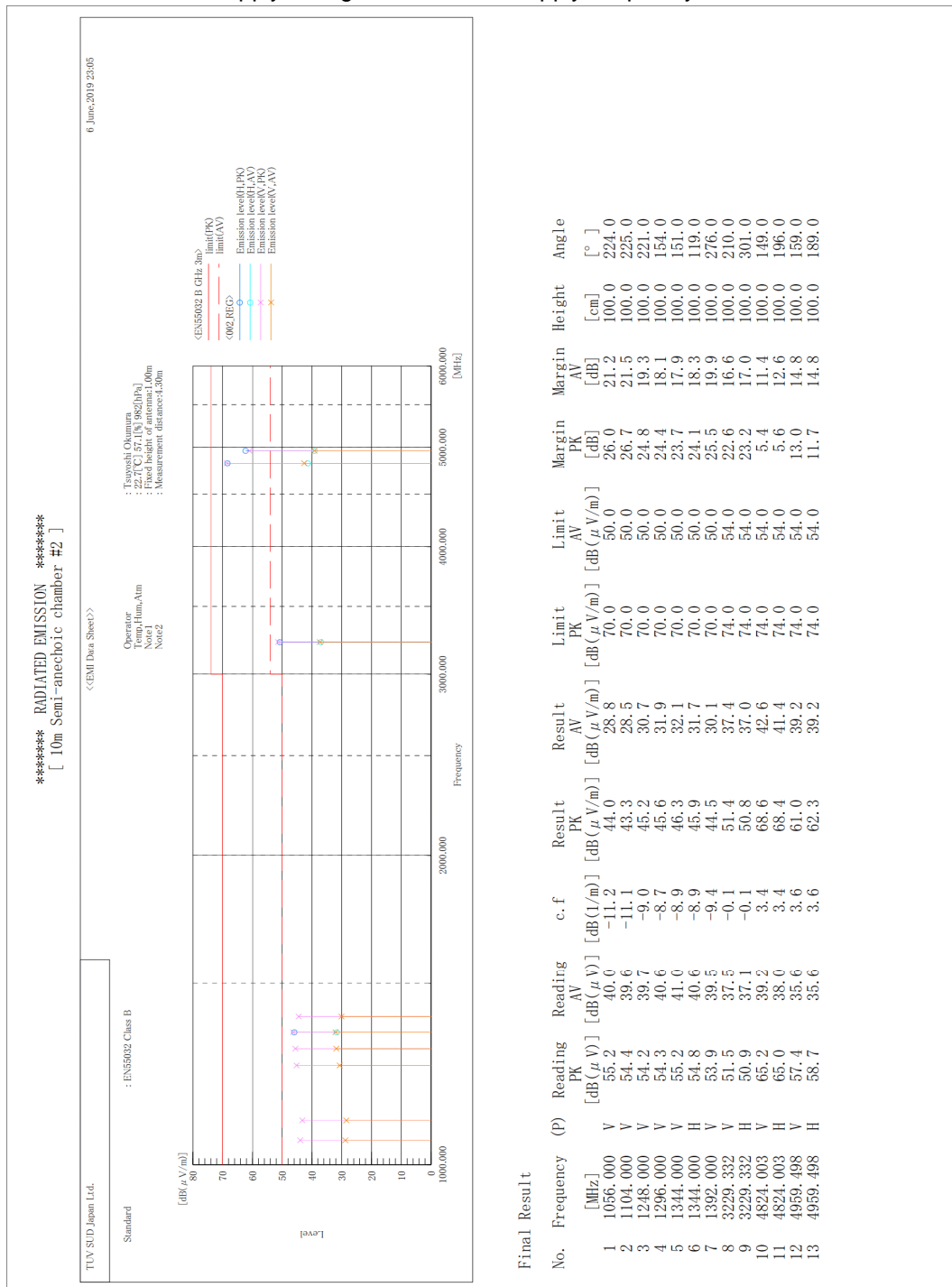
Emission level =  $32.0 + 0.7 + 1.7 = 34.4 \text{ dB}\mu\text{V/m}$

Margin =  $50.0 - 34.4 = 15.6 \text{ dB}$

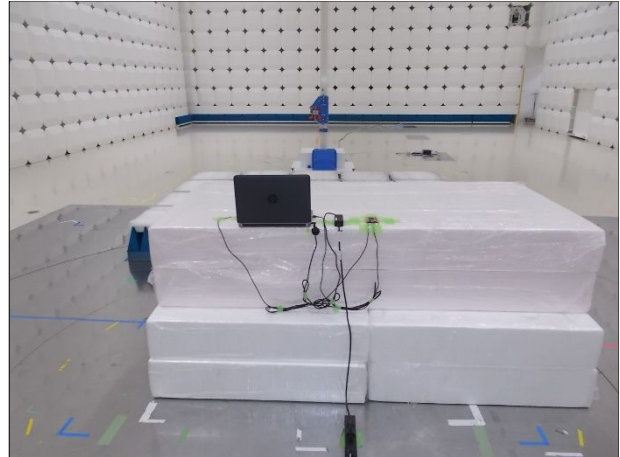
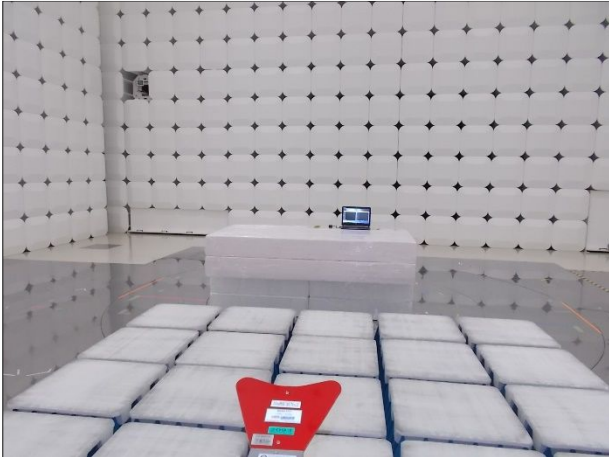
## 4.2.3 Test data and Configuration photographs

Operation mode	Continuous transmission & reception mode
EUT	X50A-M01, S/N: M001 - Modification State 0

Date of test: 06-June-2019 Supply voltage: AC 230 V Supply frequency: 50 Hz



Radiated emission (above 1 GHz)	Continuous transmission & reception mode
The photographs show maximized emission configuration.	



### 4.3 Electrostatic discharge immunity

#### 4.3.1 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 k $\Omega$  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 k $\Omega$  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 k $\Omega$  resistor located at each end is used.

Items	Description
Test method	EN 61000-4-2
Performance criterion	B
Test level	Contact discharge : $\pm 2$ kV, $\pm 4$ kV Air discharge : $\pm 2$ kV, $\pm 4$ kV, $\pm 8$ kV
Number of discharge	Contact discharge : 10 discharges Air discharge : 10 single discharge
Time interval	1 sec.
Table size	Wooden table (W) 1.5 × (D) 1.0 × (H) 0.8 m
Horizontal coupling plane size	1.6 m × 0.8 m
Vertical coupling plane size	0.5 m × 0.5 m

#### 4.3.2 Discharge locations

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

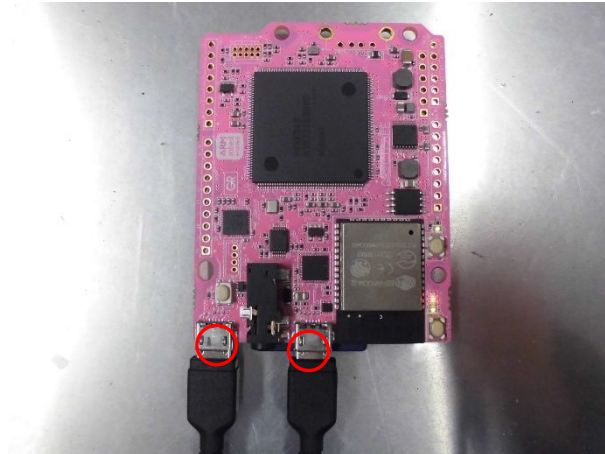


Figure 1

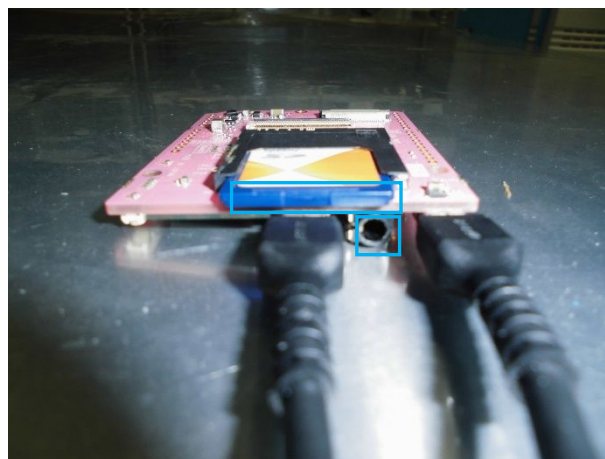


Figure 2

#### 4.3.3 Test data and Configuration photographs

Operation mode	Continuous transmission & reception mode
EUT	X50A-M01, S/N: M002 - Modification State 0

Date of test / Climatic condition : 10-June-2019 / 26.4 °C, 35.0 %, 982 hPa  
 Test place : Shielded room No.1  
 Test engineer : Tadayoshi Yamagishi

Unit 2

Supply voltage: AC 230 V Supply frequency: 50 Hz

##### Contact discharge to conductive part

Discharge Point (Refer to discharge locations)	Result of performance criterion				Test result
	Test voltage 2 kV		Test voltage 4 kV		
	+	-	+	-	
Contact discharge	A	A	A	A	PASS
Horizontal Coupling Plane (Indirect) Front, Right, Back, Left edge	A	A	A	A	PASS
Vertical Coupling Plane (Indirect) Front, Right, Back, Left side	A	A	A	A	PASS

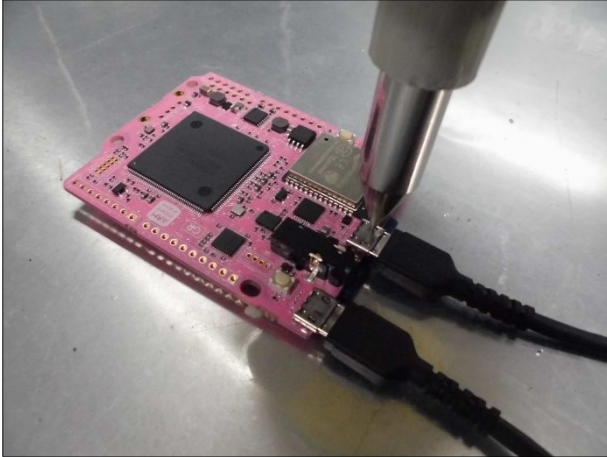
B: Image was disturbed when applying disturbance. It was self-recoverable to normal operation after the test.

##### Air discharge to insulating surface

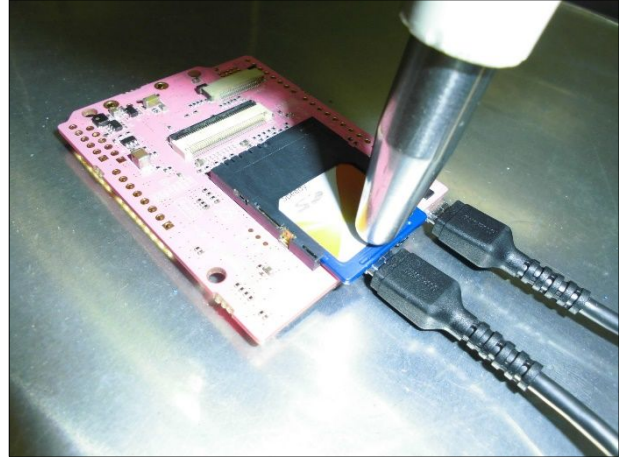
Discharge Point (Refer to discharge locations)	Result of performance criterion						Test result
	Test voltage 2 kV		Test voltage 4 kV		Test voltage 8 kV		
	+	-	+	-	+	-	
Air discharge	A	A	A	A	A	A	PASS

Electrostatic discharge immunity	Continuous transmission & reception mode
----------------------------------	--

Contact discharge



Air discharge



Operation mode	Stand-by mode
EUT	X50A-M01, S/N: M002 - Modification State 0

Date of test / Climatic condition : 10-June-2019 / 26.4 °C, 35.0 %, 982 hPa  
 Test place : Shielded room No.1  
 Test engineer : Tadayoshi Yamagishi

Unit 2  
 Supply voltage: AC 230 V Supply frequency: 50 Hz

**Contact discharge to conductive part**

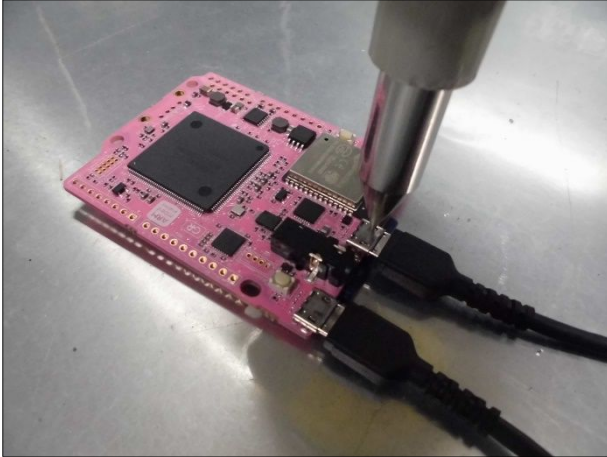
Discharge Point (Refer to discharge locations)	Result of performance criterion				Test result
	Test voltage 2 kV		Test voltage 4 kV		
	+	-	+	-	
Contact discharge	A	A	A	A	PASS
Horizontal Coupling Plane (Indirect) Front, Right, Back, Left edge	A	A	A	A	PASS
Vertical Coupling Plane (Indirect) Front, Right, Back, Left side	A	A	A	A	PASS

**Air discharge to insulating surface**

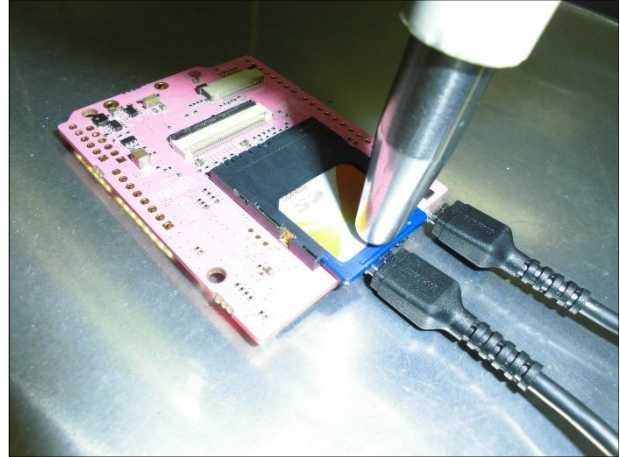
Discharge Point (Refer to discharge locations)	Result of performance criterion						Test result
	Test voltage 2 kV		Test voltage 4 kV		Test voltage 8 kV		
	+	-	+	-	+	-	
Air discharge	A	A	A	A	A	A	PASS

Electrostatic discharge immunity	Stand-by mode
----------------------------------	---------------

Contact discharge



Air discharge



#### 4.4 Radio-frequency electromagnetic field immunity

##### 4.4.1 Measurement condition

Table-top EUT is placed on a non-conductive 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-6 GHz
Frequency step	1 %
Dwell time	3.0 sec.
Modulation	AM 80 %, 1 kHz
EUT direction	Front, Right, Back, Left
Antenna polarity	Horizontal and Vertical
Test distance	1.4 m (80 MHz-1 GHz), 3 m (1 GHz-6 GHz)
Antenna height	1.3 m (80 MHz-1 GHz), 1.55 m (1 GHz-6 GHz)
Table size	Styrene foam table (W) 1.5 × (D) 1.0 × (H) 0.8 m

#### 4.4.2 Test data and Configuration photographs

Operation mode	Continuous transmission & reception mode
EUT	X50A-M01, S/N: M001 - Modification State 0

Date of test / Climatic condition : 07-June-2019 / 23.0 °C, 54.3 %, 983 hPa  
 Test place : Small anechoic chamber  
 Test engineer : Tadayoshi Yamagishi

Unit 1

Supply voltage: AC 230 V Supply frequency: 50 Hz

#### 80 MHz-6 GHz

EUT direction	Test level (V/m)	Antenna polarity	Result of performance criterion	Test result
Front (0°)	3	Horizontal	A	PASS*1
		Vertical	A	PASS*1
Right (90°)	3	Horizontal	A	PASS*1
		Vertical	A	PASS*1
Back (180°)	3	Horizontal	A	PASS*2
		Vertical	A	PASS*3
Left (270°)	3	Horizontal	A	PASS*4
		Vertical	A	PASS*3

PASS \*1: RF operation Frequency stops at 2400.325 MHz to 2424.320 MHz, but after unplug / plug the USB cable, and re-setup, it will recover.  
 Since the frequency is applicable to an exclusion band, it is regarded as pass at judgment of the applicant.

PASS \*2: RF operation Frequency stops at 2329.923 MHz to 2448.571 MHz, but after unplug / plug the USB cable, and re-setup, it will recover.  
 Since the frequency is applicable to an exclusion band, it is regarded as pass at judgment of the applicant.

PASS \*3: RF operation Frequency stops at 2424.320 MHz, but after unplug / plug the USB cable, and re-setup, it will recover.  
 Since the frequency is applicable to an exclusion band, it is regarded as pass at judgment of the applicant.

PASS \*4: RF operation Frequency stops at 2400.325 MHz, but after unplug / plug the USB cable, and re-setup, it will recover.  
 Since the frequency is applicable to an exclusion band, it is regarded as pass at judgment of the applicant.

Radio-frequency electromagnetic field immunity

Continuous transmission & reception mode

80 MHz -1 GHz



80 MHz -1 GHz



1 GHz -6 GHz



1 GHz -6 GHz



Operation mode	Stand-by mode
EUT	X50A-M01, S/N: M001 - Modification State 0

Date of test / Climatic condition : 07-June-2019 / 23.0 °C, 54.3 %, 983 hPa  
 Test place : Small anechoic chamber  
 Test engineer : Hiroomi Tsuchiya

Unit 1

Supply voltage: AC 230 V Supply frequency: 50 Hz

#### 80 MHz-6 GHz

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

Radio-frequency electromagnetic field immunity	Stand-by mode
<p data-bbox="151 347 327 380">80 MHz-1 GHz</p> 	<p data-bbox="810 347 986 380">80 MHz-1 GHz</p> 
<p data-bbox="151 869 327 902">1 GHz-6 GHz</p> 	<p data-bbox="810 869 986 902">1 GHz-6 GHz</p> 

## 4.5 Electrical fast transient/burst immunity

### 4.5.1 Measurement condition

The EUT is placed on an insulating support of 0.1 m height from the reference ground plane. All cables connected to the EUT are placed on the insulating support of 0.1 m height from the reference ground plane. A coupling/decoupling network (CDN) or a capacitive coupling clamp is placed at a specified distance from table-top EUT or floor-standing EUT.

CDN is used for test of telecommunication ports. Where appropriate CDN is not obtained, capacitive coupling clamp is used.

Capacitive coupling clamp is used for test of signal and control ports etc.

Items	Description
Test method	EN 61000-4-4
Performance criterion	B
Test level	AC power port : N/A
	Signal port : $\pm 0.5$ kV
	DC power port : N/A
Specification of wave form	
Rise time of one pulse	5 ns
Impulse duration	50 ns
Repetition frequency	5 kHz
Burst duration	15 ms
Burst period	300 ms
Duration	60 sec.

#### 4.5.2 Test data and Configuration photographs

Operation mode	Continuous transmission & reception mode
EUT	X50A-M01, S/N: M002 - Modification State 0

Date of test / Climatic condition : 10-June-2019 / 26.4 °C, 35.0 %, 982 hPa  
 Test place : Shielded room No.1  
 Test engineer : Tadayoshi Yamagishi

Unit 3

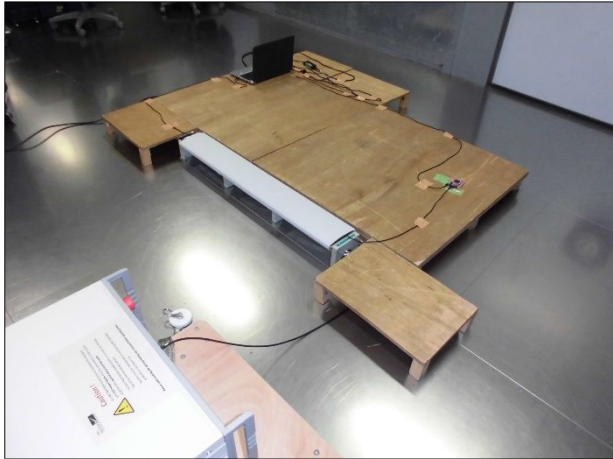
Supply voltage: AC 230 V Supply frequency: 50 Hz

Coupling	Injection method	Test voltage (kV)	Polarity (+/-)	Result of performance criterion	Test result
Signal port Micro USB 1	Clamp	0.5	+	A	PASS
			-	A	PASS
Signal port Micro USB 2	Clamp	0.5	+	A	PASS
			-	A	PASS

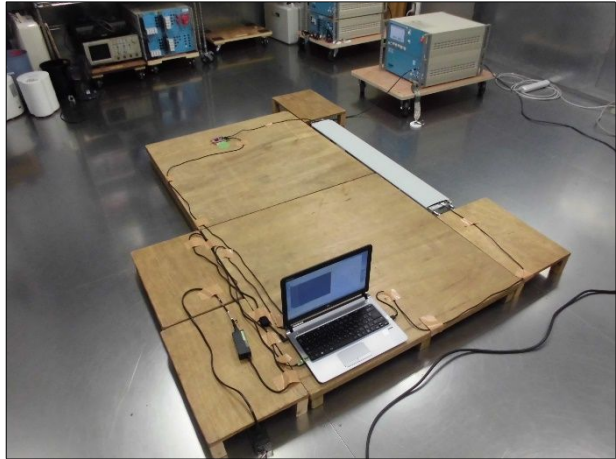
Electrical fast transient/burst immunity

Continuous transmission & reception mode

Micro USB 1



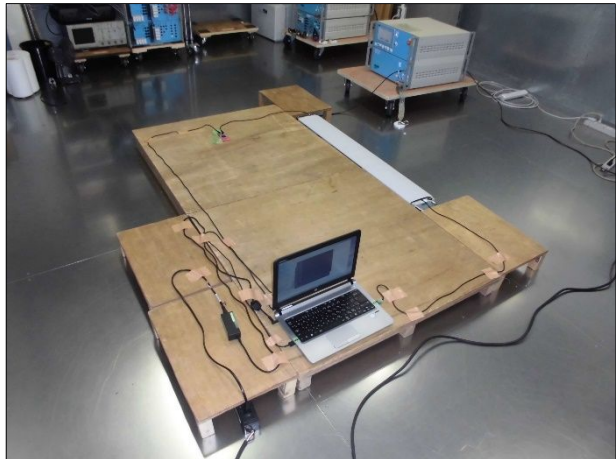
Micro USB 1



Micro USB 2



Micro USB 2



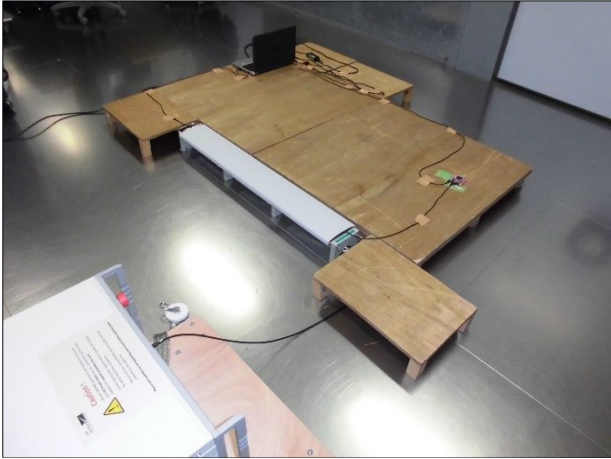
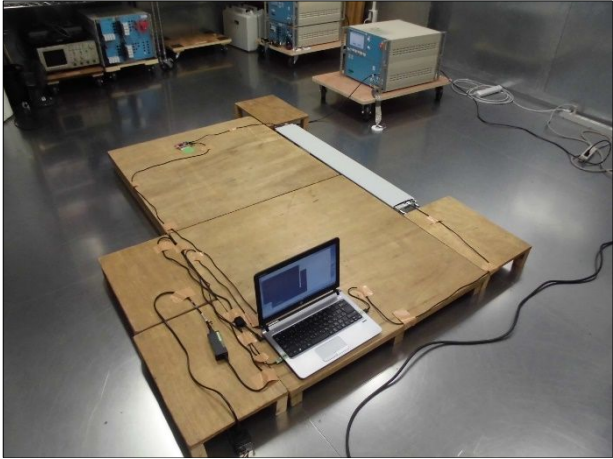
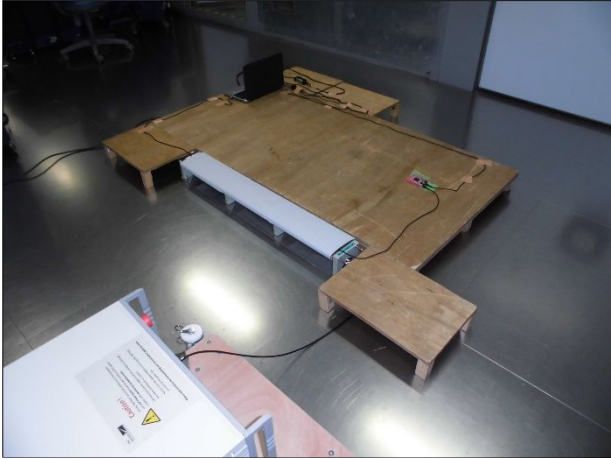
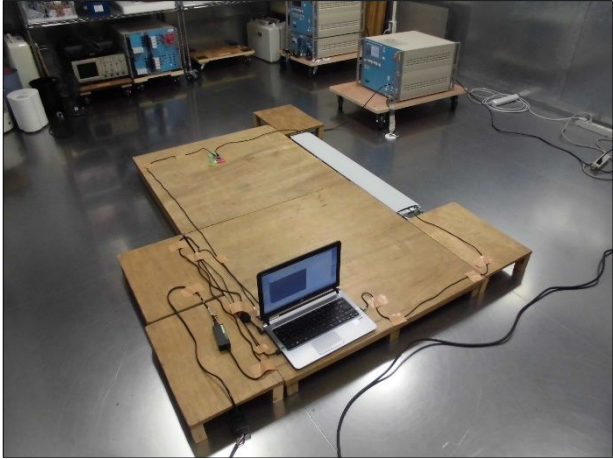
Operation mode	Stand-by mode
EUT	X50A-M01, S/N: M002 - Modification State 0

Date of test / Climatic condition : 10-June-2019 / 26.4 °C, 35.0 %, 982 hPa  
 Test place : Shielded room No.1  
 Test engineer : Tadayoshi Yamagishi

Unit 3

Supply voltage: AC 230 V Supply frequency: 50 Hz

Coupling	Injection method	Test voltage (kV)	Polarity (+/-)	Result of performance criterion	Test result
Signal port Micro USB 1	Clamp	0.5	+	A	PASS
			-	A	PASS
Signal port Micro USB 2	Clamp	0.5	+	A	PASS
			-	A	PASS

Electrical fast transient/burst immunity	Stand-by mode
<p>Micro USB 1</p> 	<p>Micro USB 1</p> 
<p>Micro USB 2</p> 	<p>Micro USB 2</p> 

#### 4.6 Conducted disturbances, induced by radio-frequency fields immunity

##### 4.6.1 Measurement condition

EUT is placed on an insulating support of 0.1 m height from the reference ground plane. Cables of the EUT are placed on an insulating support of 0.03 m or 0.05 m height from the reference ground plane whenever possible.

If coupling/decoupling network (CDN) is applicable, appropriate CDN is used. If CDN is not applicable, EM clamp etc. is used.

CDN or capacitive coupling clamp is placed at a specified distance from table-top EUT or floor-standing EUT. Cables between the EUT and CDN are shorten as much as possible and placed without bundling.

Cables connected to the EUT and not subject to the test disconnected or attached with decoupling network whenever possible.

CDN is terminated in accordance with specified priority.

Where the EUT has a hand-held accessory, an artificial hand is used.

During the test, the power obtained from output level setting is supplied to CDN or EM clamp etc., and the signals modulated over the frequency ranges to be considered are swept and injected into CDN or EM clamp etc. In addition, the dwell time is designated by the applicant.

Items	Description
Test method	EN 61000-4-6
Performance criterion	A
Test level	AC power port : N/A
	Signal port : 3 V (e.m.f.)
	DC power port : N/A
Frequency range	0.15 MHz-80 MHz
Frequency step	1 %
Dwell time	3.0 sec.
Modulation	AM 80 %, 1 kHz

#### 4.6.2 Test data and Configuration photographs

Operation mode	Continuous transmission & reception mode
EUT	X50A-M01, S/N: M002 - Modification State 0

Date of test / Climatic condition : 07-June-2019 / 23.0 °C, 65.1 %, 974 hPa  
 Test place : Small anechoic chamber  
 Test engineer : Tadayoshi Yamagishi

Unit 2

Supply voltage: AC 230 V Supply frequency: 50 Hz

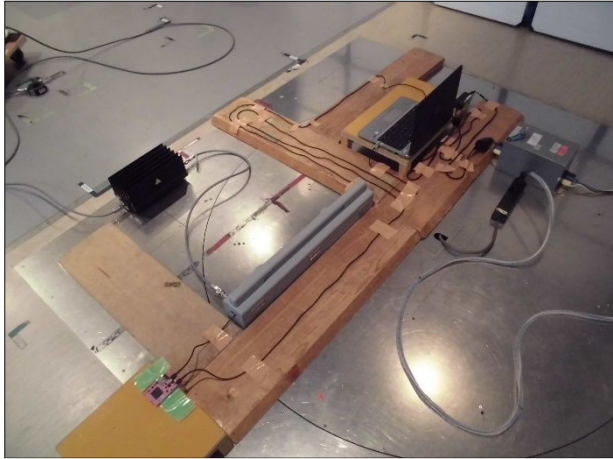
#### 0.15 MHz-80 MHz

Coupling	Injection method	Test voltage (kV)	Polarity (+/-)	Result of performance criterion	Test result
Signal port Micro USB 1	Clamp	3.0	+	A	PASS
			-	A	PASS
Signal port Micro USB 2	Clamp	3.0	+	A	PASS
			-	A	PASS

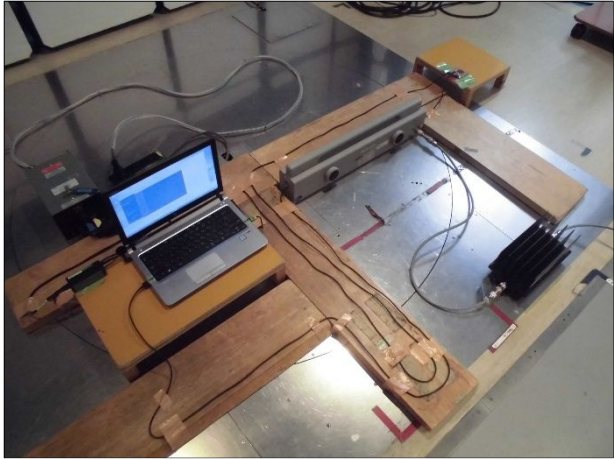
Conducted disturbances, induced by radio-frequency fields immunity

Continuous transmission & reception mode

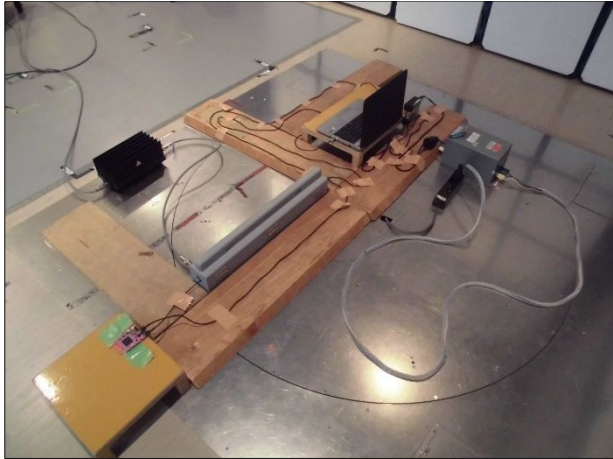
Micro USB 1



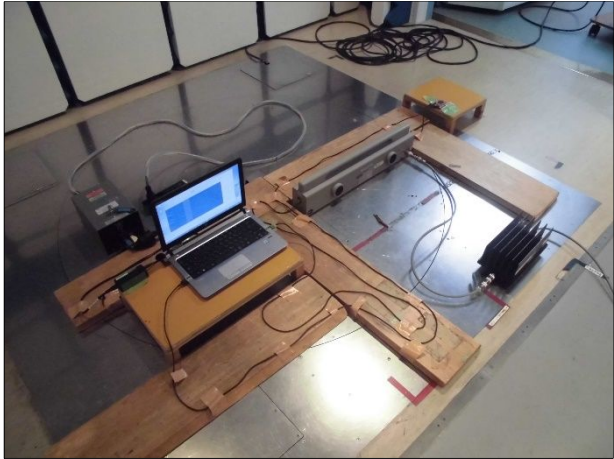
Micro USB 1



Micro USB 2



Micro USB 2



Operation mode	Stand-by mode
EUT	X50A-M01, S/N: M002 - Modification State 2

Date of test / Climatic condition : 07-June-2019 / 23.0 °C, 65.1 %, 974 hPa  
 Test place : Small anechoic chamber  
 Test engineer : Tadayoshi Yamagishi

Unit 2

Supply voltage: AC 230 V Supply frequency: 50 Hz

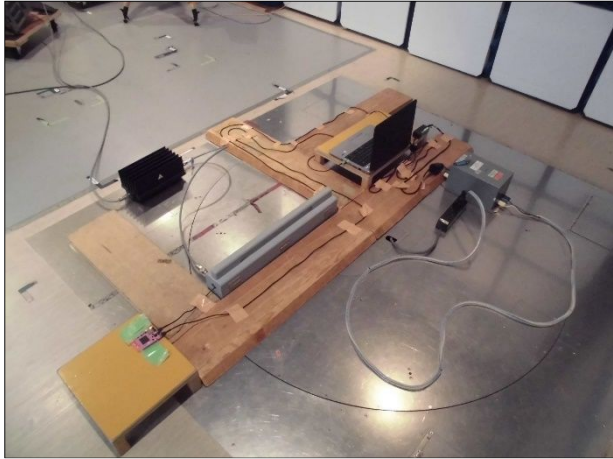
#### 0.15 MHz-80 MHz

Coupling	Injection method	Test voltage (kV)	Polarity (+/-)	Result of performance criterion	Test result
Signal port Micro USB 1	Clamp	3.0	+	A	PASS
			-	A	PASS
Signal port Micro USB 2	Clamp	3.0	+	A	PASS
			-	A	PASS

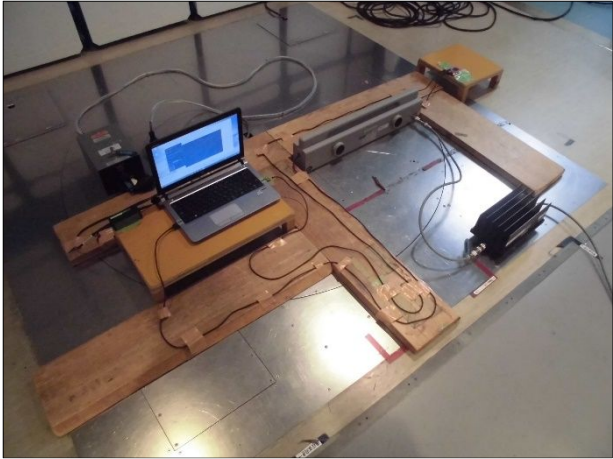
Conducted disturbances, induced by radio-frequency fields immunity

Stand-by mode

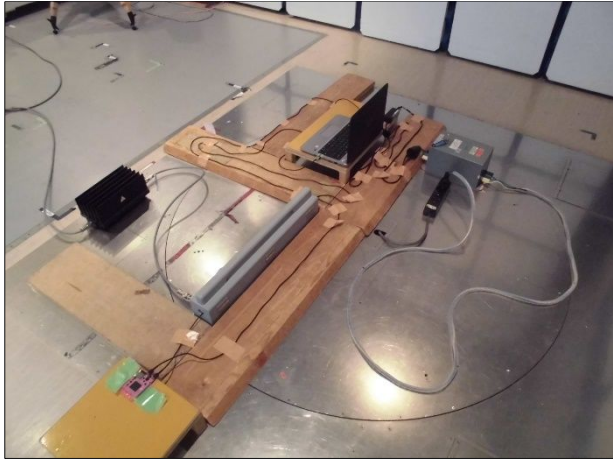
Micro USB 1



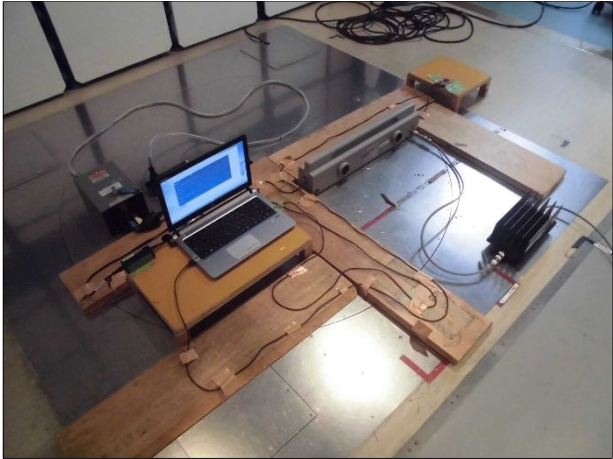
Micro USB 1



Micro USB 2



Micro USB 2



## 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**

Address: 5-4149-7 Hachimanpara, Yonezawa-shi, Yamagata, 992-1128 Japan  
Phone: +81-238-28-2881  
Fax: +81-238-28-2888

**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-2020	17-May-2019
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

### Radiated emission (above 1 GHz)

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
EMI Receiver	ROHDE&SCHWARZ	ESR7	101187	30-Apr-2020	02-Apr-2019
Low Noise Pre Amplifier	tsj	MLA-0118-J02-40	19326	31-Dec-2019	17-Dec-2018
Double ridged guide antenna	ETS LINDGREN	3117	00224193	31-Jan-2020	23-Jan-2019
Attenuator	HUBER+SUHNER	6803.17.B	N/A(2340)	31-Oct-2019	11-Oct-2018
Microwave cable	HUBER+SUHNER	SUCOFLEX104/1m	MY38347/4	31-Jan-2020	17-Jan-2019
Microwave cable	HUBER+SUHNER	SUCOFLEX104/9m	SN MY30038/4	31-Jan-2020	17-Jan-2019
Microwave cable	HUBER+SUHNER	SUCOFLEX106/10m	501942/6	31-Jan-2020	18-Jan-2019
Microwave cable	HUBER+SUHNER	SUCOFLEX104/2m	MY34424/4	31-Jan-2020	18-Jan-2019
Absorber	NEC TOKIN	TFA	N/A	N/A	N/A
10m Semi-anechoic Chamber	TOKIN	N/A	N/A(9005-SVSWR/TTφ3m)	31-Jan-2020	20-Jan-2019
PC	DELL	OPTIPLEX9010	00186-228-073-851	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
Horizontal coupling plane	Noise Laboratory Co., Ltd.	N/A	N/A	N/A	N/A
Vertical coupling plane	Matsushita Techno Trading	N/A	N/A	N/A	N/A

**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
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	BBHA9120D317	31-Dec-2019	20-Dec-2018
RF power amplifier	ROHDE&SCHWARZ	BBA150-D110E100	102339	31-Dec-2019	19-Dec-2018
Directional coupler	WERLATONE	C10117-10	11296	30-Jun-2019	25-Jun-2018

**Electrical fast transient/burst immunity**

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
Ultra compact simulator	EM TEST	UCS500M4	V0550100978	31-Mar-2020	25-Mar-2019
TRANSIENT TEST SYSTEM	EMC-PARTNER	TRA2000IN4	871	31-May-2019	16-May-2018
Immunity Test System	EMC-PARTNER	IMU3000F5-S6-T6-D-V	1503	30-Sep-2019	27-Sep-2018
Capacitive coupling clamp	EM TEST	HFK	N/A(0652)	31-Mar-2020	25-Mar-2019
Capacitive coupling clamp	EMC-PARTNER	CN-EFT1000	1647	30-Jun-2019	19-Jun-2018

**Conducted disturbances, induced by radio-frequency fields immunity z**

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
RF power amplifier	PRANA	DP600D	1201-1169	31-May-2020	15-May-2019
Directional coupler	WERLATONE	5960	96512	31-Jan-2020	16-Jan-2019
Attenuator	Weinschel	WA53-6-33	A797	31-Dec-2019	17-Dec-2018
CDN	Fischer Custom Communication, Inc.	FCC-801-M2/M3	120566	31-Mar-2020	06-Mar-2019
EM injection clamp	Fischer Custom Communication, Inc.	F-203I-A-23mm	160836	30-Sep-2019	21-Sep-2018
EM injection clamp	Fischer Custom Communication, Inc.	F-203I-A-23mm	171327	31-Mar-2020	08-Mar-2019
50Ω terminator	RS	090-0510C	N/A(S030)	31-Jul-2019	11-Jul-2018
Software	TSJ	TEPTO-CS2	Ver.1.0.83	N/A	N/A