Zacta

TEST REPORT

Report number : Z101C-16028
Issue date : March 22, 2016

The device, as described herewith, was tested pursuant to applicable test procedure and complies with the requirements of;

FCC Part15 Subpart C

The test results are traceable to the international or national standards.

Applicant	:	Wacom Co., Ltd.
Equipment under test (EUT)	:	Pen Tablet
Model number	:	CTL-671
FCC ID	:	HV4CTL671

Date of test : March 11, 2016
Test place : TÜV SÜD Zacta Ltd. Yonezawa Testing Center
4149-7 Hachimanpara 5-chome
Yonezawa-shi Yamagata 992-1128 Japan
Phone: +81-238-28-2880 Fax: +81-238-28-2888
Test results : Complied

The results in this report are applicable only to the equipment tested.
This report shall not be re-produced except in full without the written approval of TÜV SÜD Zacta Ltd.
This test report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Tested by : Akihiro Goto
Akihiro Goto

Tested by : Taiki Watanabe
Taiki Watanabe

Authorized by : Hiro Suzuki
Hiroaki Suzuki
Manager of EMC Technical Department

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1. Summary of Test

1.1 Purpose of test

It is the original test in order to verify conformance to FCC Part 15 Subpart C.

1.2 Standards

CFR47 FCC Part 15 Subpart C

1.2.1 Test Methods

ANSI C63.10-2013

1.2.2 Deviation from standards

None

1.3 List of applied test to the EUT

Test items Section	Classification of EUT	Condition	Result
15.209	Radiated Emissions	Radiated	PASS
15.207	AC Power Line Conducted Emissions	Conducted	PASS

1.3.1 Test set up

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1.4 Modification to the EUT by laboratory

None

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2. Equipment Under Test

2.1 General Description of equipment

EUT is the Pen Tablet.

2.2 EUT information

Applicant	:	Wacom Co., Ltd. 2-510-1, Toyonodai, Kazo-shi, Saitama, 349-1148 Japan Phone: +81-480-78-1211 Fax: +81-480-78-1404
Equipment under test	:	Wacom
Trade name	:	Pen tablet
Model number	:	CTL-671
Serial number	:	4EBPS00028
EUT condition	:	Pre-Production
Power ratings	:	DC 5V (USB)
Size	:	(W) 277 × (D) 189 × (H) 7.5 mm
Environment	:	Indoor use
Terminal limitation	:	-20˚C to 60˚C
RF Specification Frequency range	:	667kHz
Modulation method	:	OOK (On-Off Keying)

2.3 Variation of the family model(s)

Not applicable

2.4 Operating mode

[Normal Operation]
i) Tablet test setup
ii) Select a Packet measurement
iii) Start test mode

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3. Configuration of equipment

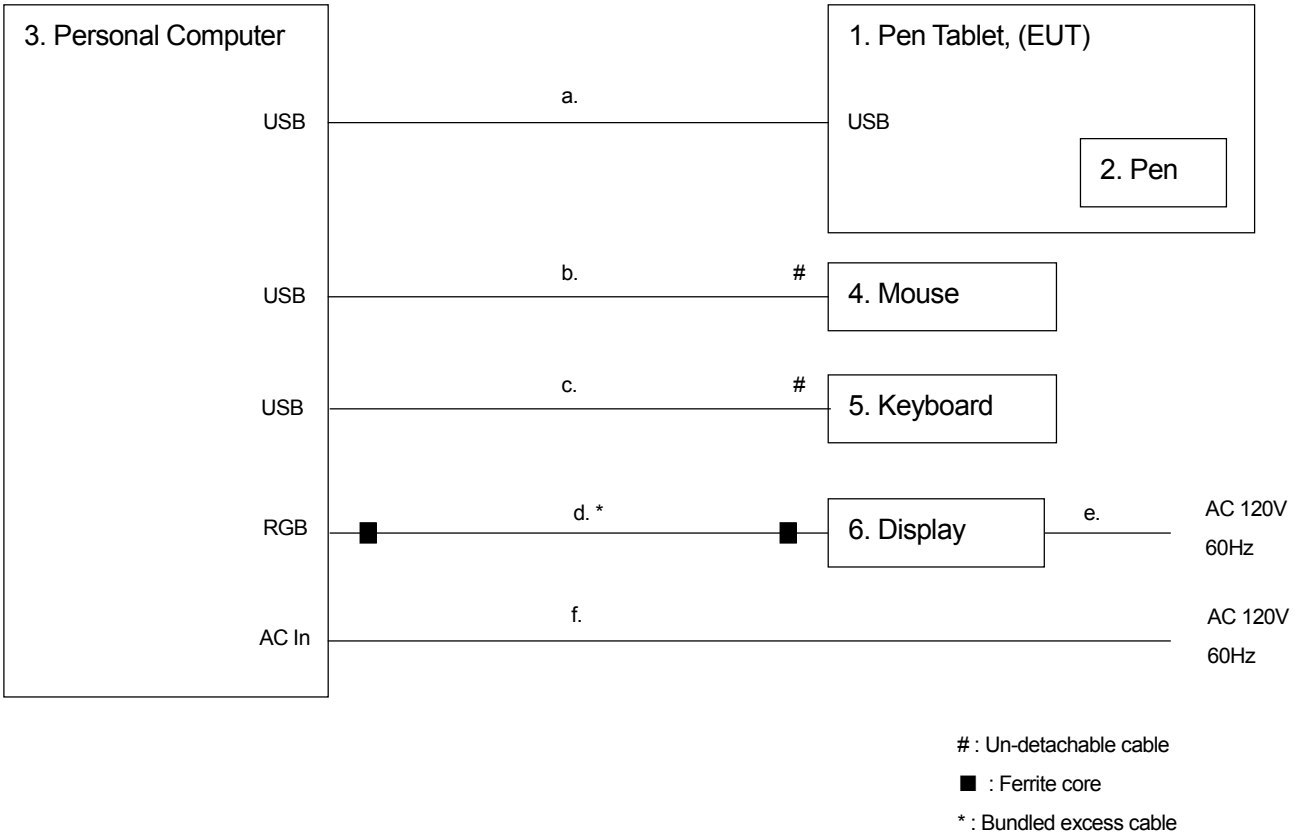
3.1 Equipment(s) used

No.	Equipment	Company	Model No.	Serial No.	FCC ID / DoC	Comment
1	Pen Tablet	Wacom	CTL-671	4EBPS00028	HV4CTL671	EUT
2	Pen	Wacom	LP-171	N/A	-	Accessory
3	Personal Computer	DELL	DCSM	75465BX	DoC	-
4	USB Mouse	Logitech	M-BT85	LNA43400219	DoC	-
5	Keyboard(USB)	HP	PR1101U	CNP3010028	DoC	-
6	Display	SAMSUNG	712N D	MJ17HMDY308893A	DoC	-

3.2 Cable(s) used

No.	Cable	Length[m]	Shield	Connector	Comment
a	USB cable	1.0	Yes	Metal	Accessory
b	Mouse cable	1.8	Yes	Metal	-
c	Keyboard cable	1.9	No	Metal	-
d	RGB cable for Display	1.9	Yes	Metal	-
e	AC Power cord for Display	1.8	No	Plastic	-
f	AC Power cord for PC	2.0	No	Plastic	-

3.3 System configuration



Note1: Numbers assigned to equipment or cables on this diagram correspond to the list in “3.1 Equipment(s) used” and “3.2 Cable(s) used”.
Note2: Two ferrite cores of RGB cable (No. d) are not an accessory of EUT.

4. Radiated Emissions

4.1 Measurement procedure [FCC 15.209]

Test was applied by following conditions.

Test method	:	ANSI C63.10
Frequency range	:	9kHz to 30MHz
Test place	:	3m Semi-anechoic chamber
EUT was placed on	:	FRP table / (W)2.0m × (D)1.0m × (H)0.8m
Antenna distance	:	3m

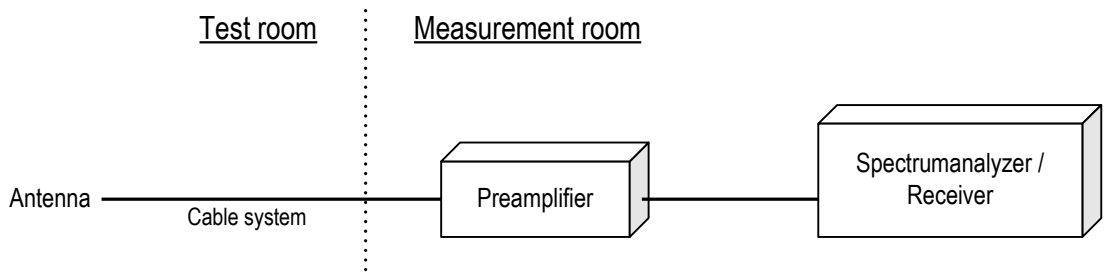
Test receiver setting

- Detector	:	Average (9kHz-90kHz, 110kHz-490kHz), Quasi-peak
- Bandwidth	:	200Hz, 120kHz

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

EUT operating mode is selected to emit the maximum noise. Overall frequency range is investigated with spectrum analyzer using peak detector. Then, emission measurements up to 30MHz were performed with test receiver in above setting. The turntable and the Loop antenna are rotated by 360 degrees and stopped at azimuth of producing the maximum emission. Sufficient time for EUT, peripherals and test equipment is provided in order for them to warm up to their normal operating condition.

- Test configuration



Test was applied by following conditions.

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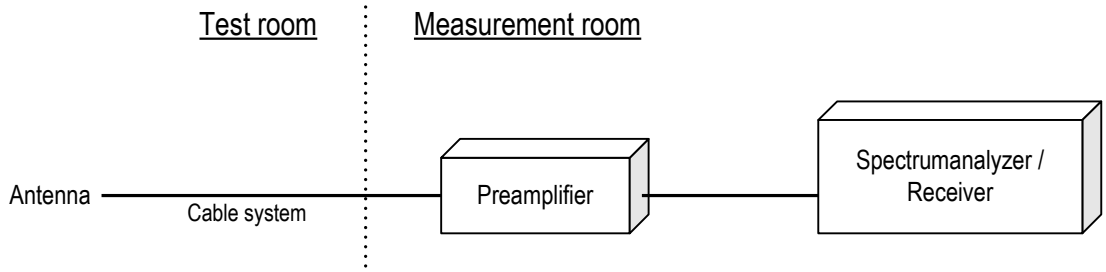
Test method	:	ANSI C63.10
Frequency range	:	30MHz to 1000MHz
Test place	:	10m Semi-anechoic chamber No.2
EUT was placed on	:	FRP table / (W)2.0m × (D)1.0m × (H)0.8m
Antenna distance	:	10m

Test receiver setting

- Detector	:	Quasi-peak
- Bandwidth	:	120kHz

EUT operating mode is selected to emit the maximum noise. Overall frequency range is investigated with spectrum analyzer using peak detector. Then, emission measurements up to 1000MHz were performed with test receiver in above setting. In order to find the maximum emissions, antenna is adjusted between 1m and 4m in height and varied its polarization (horizontal and vertical), and EUT azimuth was also varied by rotating turntable 0 to 360 degrees. Sufficient time for EUT, peripherals and test equipment is provided in order for them to warm up to their normal operating condition.

- Test configuration



4.2 Calculation method

[9kHz to 150kHz]
Emission level = Reading + (Ant. factor + Cable system loss)
Margin = Limit – Emission level

[150kHz to 1000MHz]
Emission level = Reading + (Ant. factor + Cable system loss – Amp. Gain)
Margin = Limit – Emission level

Example:
Limit @ 350.0MHz : 37.0dBµV/m
Reading = 41.1dBµV c.f = -11.8dB/m
Emission level = 41.1 - 11.8 = 29.3dBµV/m
Margin = 37.0 - 39.3 = 7.7dB

4.3 Limit

Frequency [MHz]	Field strength		Distance [m]
	[uV/m]	[dBuV/m]	
0.009-0.490	2400 / F [kHz]	20logE [uV/m]	300
0.490-1.705	24000 / F [kHz]	20logE [uV/m]	30
1.705-30	30	29.5	30
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	300	54.0	3

Frequency [MHz]	Limit [dBuV/m]	Distance [m]
30-300	30	10
300-1000	37	10

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level [dBuV/m] = 20log Emission [uV/m]
3. Measurements were corrected to 30m using 40log (3/30) = -40.0dB
4. CISPR 22 limit was applied radiated emission measurements as prescribed in FCC Part 15 section 15.109(g).

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4.4 Test data

Date : Mar. 11, 2016
Temperature : 21.3 [˚C]
Humidity : 26.8 [%] Test engineer :
Test place : 3m Semi-anechoic chamber Taiki Watanabe

[9kHz to 30MHz]
CTL-671
Pen: LP-171

Frequency [MHz]	Reading [dBuV] At 3m	c.f [dB(1/m)]	Result [dBuV/m] At 3m	Result [dBuV/m] At 30m	Limit [dBuV/m] At 30m	Margin [dB]	Result
0.667	51.6	-5.0	46.6	6.6	31.1	24.5	PASS
1.334	29.7	-5.0	24.7	-15.3	25.1	40.4	PASS
2.001	37.6	-4.9	32.7	-7.3	29.5	36.8	PASS
2.668	29.3	-4.9	24.4	-15.6	29.5	45.1	PASS
3.335	31.8	-4.9	26.9	-13.1	29.5	42.6	PASS

Date : Mar. 11, 2016
Temperature : 18.9 [˚C]
Humidity : 25.2 [%] Test engineer :
Test place : 10m Semi-anechoic chamber No.2 Akihiro Goto

[30MHz to 1000MHz]
CTL-671
Pen: LP-171

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
1	30.004	V	29.2	-4.5	24.7	30.0	5.3	100.0	321.0
2	31.503	V	31.0	-5.1	25.9	30.0	4.1	279.0	0.0
3	33.002	V	30.0	-5.6	24.4	30.0	5.6	299.0	359.0
4	34.502	V	30.3	-6.2	24.1	30.0	5.9	324.0	353.0
5	36.000	V	33.1	-6.8	26.3	30.0	3.7	317.0	345.0
6	37.502	H	30.1	-7.3	22.8	30.0	7.2	400.0	0.0
7	95.951	H	35.2	-12.8	22.4	30.0	7.6	400.0	132.0
8	126.009	V	30.7	-8.6	22.1	30.0	7.9	400.0	64.0
9	640.006	V	33.0	-3.0	30.0	37.0	7.0	226.0	47.0

5. AC Power Line Conducted Emissions

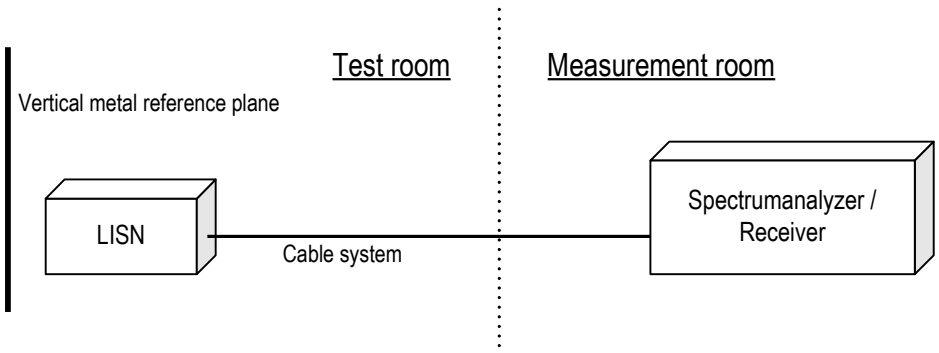
5.1 Measurement procedure [FCC 15.207]

Test was applied by following conditions.

Test method	:	ANSI C63.10
Frequency range	:	0.15MHz to 30MHz
Test place	:	10m Semi-anechoic chamber No.2
EUT was placed on	:	FRP table / (W)2.0m × (D)1.0m × (H)0.8m
Vertical Metal Reference Plane	:	(W)2.0m × (H)2.0m 0.4m away from EUT
Test receiver setting		
- Detector	:	Quasi-peak, Average
- Bandwidth	:	9kHz

EUT and peripherals are connected to 50Ω/50μH Line Impedance Stabilization Network (LISN) which are connected to reference ground plane, and are placed 80cm away from EUT. Excess of AC power cable is bundled in center.
LISN for peripheral is terminated in 50Ω.
EUT operating mode is selected to emit the maximum noise. Overall frequency range is investigated with spectrum analyzer using peak detector. Maximum emission configuration is determined by manipulating the EUT, peripherals, interconnecting cables. Then, emission measurements are performed with test receiver in above setting to each current-carrying conductor of the mains port. Sufficient time for EUT, peripherals and test equipment is provided in order for them to warm up to their normal operating condition. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits.

- Test configuration



5.2 Calculation method

Emission level = Reading + (LISN. factor + Cable system loss)
Margin = Limit – Emission level

Example:
Limit @ 6.770MHz : 60.0dBμV(Quasi-peak)
: 50.0dBμV(Average)
(Quasi peak) Reading = 41.2dBμV c.f = 10.3dB
Emission level = 41.2 + 10.3 = 51.5dBμV
Margin = 60.0 – 51.5 = 8.5dB
(Average) Reading = 35.0dBμV c.f = 10.3dB
Emission level = 35.0 + 10.3 = 45.3dBμV
Margin = 50.0 – 45.3 = 4.7dB

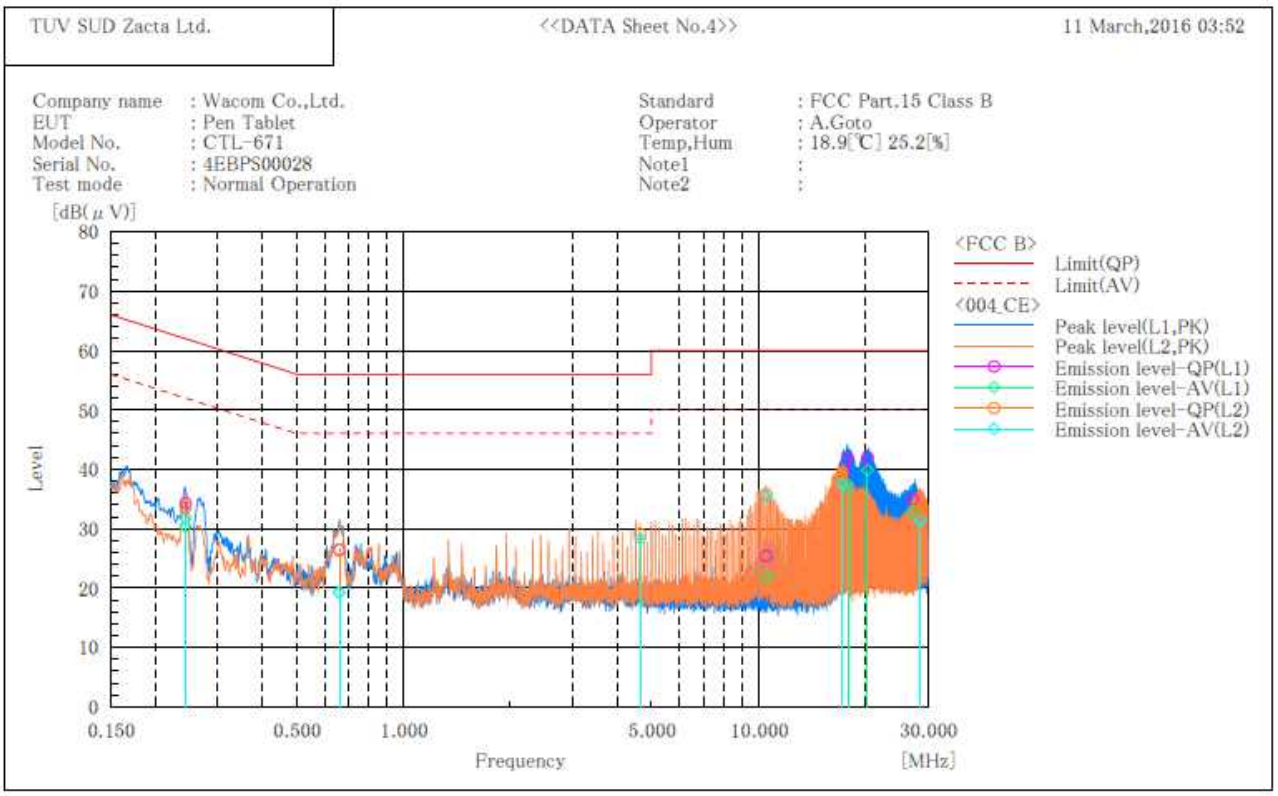
5.3 Limit

Frequency [MHz]	Limit	
	QP [dBuV]	AV [dBuV]
0.15-0.5	66-56*	56-46*
0.5-5	56	46
5-30	60	50

*: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

5.4 Test data

******* CONDUCTED EMISSION at MAINS PORT *******
[10m Semi-anechoic chamber #2]



Final Result

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c.f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.244	23.8	19.8	10.5	34.3	30.3	62.0	52.0	27.7	21.7
2	0.661	15.9	8.7	10.5	26.4	19.2	56.0	46.0	29.6	26.8
3	10.498	14.3	10.7	11.1	25.4	21.8	60.0	50.0	34.6	28.2
4	17.825	30.5	26.0	11.4	41.9	37.4	60.0	50.0	18.1	12.6
5	20.267	30.4	28.2	11.6	42.0	39.8	60.0	50.0	18.0	10.2
6	27.106	23.0	21.0	11.9	34.9	32.9	60.0	50.0	25.1	17.1

--- L2 Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c.f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.244	23.0	21.1	10.6	33.6	31.7	62.0	52.0	28.4	20.3
2	0.661	15.9	8.7	10.6	26.5	19.3	56.0	46.0	29.5	26.7
3	4.637	18.2	17.4	10.9	29.1	28.3	56.0	46.0	26.9	17.7
4	10.493	24.6	24.2	11.2	35.8	35.4	60.0	50.0	24.2	14.6
5	17.201	27.9	26.0	11.5	39.4	37.5	60.0	50.0	20.6	12.5
6	28.542	21.4	19.4	12.0	33.4	31.4	60.0	50.0	26.6	18.6

6. Uncertainty of measurement

Expanded uncertainties stated are calculated with a coverage Factor k=2.
Please note that these results are not taken into account when measurement uncertainty considerations contained in ETSI TR 100 028-0011 determining compliance or non-compliance with test result.

Test item	Measurement uncertainty
Conducted emission at mains port	±3.0dB
Radiated emission (9kHz – 30MHz)	±4.4dB
Radiated emission (30MHz – 1000MHz)	±4.5dB
Radiated emission (1000MHz – 26GHz)	±3.9dB

7. Laboratory description

1. Location:

TÜV SÜD Zacta Ltd. Yonezawa Testing Center
4149-7 Hachimanpara 5-chome Yonezawa-shi Yamagata 992-1128 Japan
Phone: +81-238-28-2880 Fax: +81-238-28-2888

2. Facility filing information:

1) NVLAP accreditation: NVLAP Lab. code: 200306-0

2) VLAC accreditation: Lab. code: VLAC-013

Site name	Radiated emission	Conducted emission for mains port	Conducted emission for telecom port	Radiated emission (CMAD)	Expiry Date
3m Semi-anechoic chamber	VLAC-013			-	Jul. 3, 2017
10m Semi-anechoic chamber No.1				VLAC-013	
10m Semi-anechoic chamber No.2					
Shielded room No.1	-	VLAC-013		-	

3) FCC filing:

Site name	Registration Number	Expiry Date
Site 3	91065	Oct. 1, 2017
3m Semi-anechoic chamber	540072	Feb. 20, 2017
10m Semi-anechoic chamber No.1		
10m Semi-anechoic chamber No.2		
Shielded room No.1		

4) Industry Canada Oats site filing:

Site name	Sites on file: Oats 3m/10m	Expiry Date
Site 3	4224A-3	Dec. 3, 2017
3m Semi-anechoic chamber	4224A-4	
10m Semi-anechoic chamber No.1	4224A-5	
10m Semi-anechoic chamber No.2	4224A-6	Jan. 15, 2017

5) VCCI site filing:

Site name	Radiated emission	Conducted emission for mains port	Conducted emission for telecom port	Expiry Date
Site 3	R-138	C-134	T-1222	Nov. 16, 2017
3m Semi-anechoic chamber	A-0166			Jul. 3, 2017
10m Semi-anechoic chamber No.1				
10m Semi-anechoic chamber No.2				
Shielded room No.1	-	A-0166		

6) TÜV SÜD PS authorization:
Authorized as an EMC test laboratory

7) TÜV Rheinland authorization:
Authorized as an EMC test laboratory

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Appendix A. Test equipment

Radiated emission
[Testing below 30Hz]

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
EMI Receiver	ROHDE&SCHWARZ	ESCI	100764	Aug. 31, 2016	Aug. 21, 2015
Preamplifier	ANRITSU	MH648A	M96057	Jun. 30, 2016	Jun. 30, 2015
Loop antenna	ROHDE&SCHWARZ	HFH2-Z2	892246/010	Apr. 30, 2016	Apr. 2, 2015
Attenuator	TME	CFA-01NPJ-10	N/A(S456)	Mar. 31, 2016	Mar. 6, 2015
Microwave cable	SUHNER	SUCOFLEX104/9m	346316/4	Oct. 31, 2016	Oct. 22, 2015
		SUCOFLEX104/1m	322084/4	Oct. 31, 2016	Oct. 22, 2015
		SUCOFLEX104/1.5m	317226/4	Oct. 31, 2016	Oct. 22, 2015
		SUCOFLEX104/7m	41625/6	Oct. 31, 2016	Oct. 22, 2015
PC	DELL	DIMENSION E521	75465BX	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V5.3.61	N/A	N/A
3m Semi-anechoic chamber	TOKIN	N/A	N/A (9002-NSA)	Apr. 30, 2016	Apr. 27, 2015

[Testing above 30MHz]

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
EMI Receiver	ROHDE&SCHWARZ	ESR7	101187	Sep. 30, 2016	Sep. 17, 2015
Biconical antenna	Schwarzbeck	VHA9103/BBA9106	2323	Oct. 31, 2016	Oct. 5, 2015
Log periodic antenna	Schwarzbeck	UHALP9108A	0589	Oct. 31, 2016	Oct. 5, 2015
Attenuator	TDC	TAT-43B-03	N/A(S205)	Jun. 30, 2016	Jun. 23, 2015
Attenuator	TME	CFA-01NPJ-6	N/A(S274)	Jun. 30, 2016	Jun. 23, 2015
EMI Receiver	ROHDE&SCHWARZ	ESR7	101187	Sep. 30, 2016	Sep. 17, 2015
Microwave cable	SUHNER	SUCOFLEX104/1m	SN MY20467/6	Jan. 31, 2017	Jan. 12, 2016
		SUCOFLEX104/9m	MY23759/4	Jan. 31, 2017	Jan. 21, 2016
		SUCOFLEX106/10m	501944/6	Jan. 31, 2017	Jan. 12, 2016
		SUCOFLEX104/2m	MY15464/4	Jan. 31, 2017	Jan. 12, 2016
PC	DELL	OPTIPLEX9010	00186-228-073-851	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V5.4.011	N/A	N/A
10m Semi-Anechoic Chamber	TOKIN	10m Semi an-echoic Chamber No.2	N/A(NSA10mΦ3m)	Jan. 31, 2017	Jan. 8, 2016

Conducted emission at mains port

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
EMI Receiver	ROHDE&SCHWARZ	ESR7	101187	Sep. 30, 2016	Sep. 17, 2015
Attenuator	TYC	BA-PJ-10	N/A(S344)	Apr. 30, 2016	Apr. 6, 2015
Line impedance stabilization network for EUT	Kyoritsu Electrical Works, Ltd.	KNW-407F	8-2003-1	Mar. 31, 2016	Mar. 5, 2015
Line impedance stabilization network for EUT	Kyoritsu Electrical Works, Ltd.	KNW-242C	8-1096-3	Mar. 31, 2016	Mar. 5, 2015
Coaxial cable	FUJIKURA	5D-2W/5m	N/A(S336)	Jan. 31, 2017	Jan. 12, 2016
Microwave Cable	HUBER+SUHNER	SUCOFLEX106/28m	501941/6	Jan. 31, 2017	Jan. 12, 2016
Microwave Cable	HUBER+SUHNER	SUCOFLEX104/2m	MY15570/4	Jan. 31, 2017	Jan. 12, 2016
50Ω terminator	TDC	TDL-21A	N/A(S021)	Jan. 31, 2017	Jan. 22, 2016
PC	DELL	OPTIPLEX9010	00186-228-073-851	N/A	N/A
10m Semi-Anechoic Chamber	TOKIN	10m Semi an-echoic Chamber No.2	N/A(NSA3mΦ3m)	Jan. 31, 2017	Jan. 8, 2016

*: The calibrations of the above equipment are traceable to NIST or equivalent standards of the reference organizations.