

# TEST REPORT

Report number: Z071C-11041Issue Date: June 17, 2011

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

## FCC Part15 Subpart C / IC RSS-210

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

Applicant	:	Wacom Co., Ltd.
Equipment under test (EUT)	:	Pen Tablet, Pen & Touch Tablet
Model Number	:	CTL-470 CTH-470 CTH-670
FCC ID	:	HV4CTH670
IC Certification Number	:	6888A-CTH670

Test procedure	:	ANSI C63.4-2003
Date of test	:	May 23-26, 2011
Test place	:	ZACTA Technology Corporation Yonezawa Testing Center 4149-7 Hachimanpara 5-chome Yonezawa-shi Yamagata 992-1128 Japan
Test results	:	Complied

Zacta Technology Corporation certifies that no party to the application is subject to a denial of federal benefits that include FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

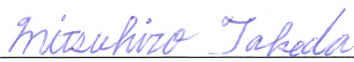
The results in this report are applicable only to the samples tested.  
This report shall not be re-produced except in full without the written approval of ZACTA Technology Corporation.

This test report must not be used by client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Tested by:



Chiaki Kanno



Mitsuhiro Takeda

Authorized by:

Jun Shimanuki  
General Manager of Technical Division

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## ***1. Summary of Test***

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### ***1.1 Purpose of test***

It is the original test in order to verify conformance to standards listed in section 1.2.

### ***1.2 Standards***

CFR47 FCC Part 15 Subpart C, RSS-210

### ***1.3 Summary of test results***

<b>Test Items Section</b>	<b>Test Items</b>	<b>Condition</b>	<b>Result</b>
RSS-Gen 4.6.1	99% Occupied Bandwidth	Radiated	<b>Pass</b>
15.209 RSS-210 A2.2 RSS-Gen 4.9, 4.10, 4.11	Radiated Emissions	Radiated	<b>Pass</b>
15.207 RSS-Gen 7.2.4	AC Power Line Conducted Emissions 150kHz – 30MHz	Conducted	<b>Pass</b>

### ***1.4 Deviation from the standard***

None

### ***1.5 Modification to the EUT by laboratory***

None

## ***2. Equipment description***

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### ***2.1 General Description of equipment***

The EUT is a Pen Tablet, Pen & Touch Tablet, which is transceiver.

### ***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 (EUT)	: Pen Tablet, Pen & Touch Tablet
Trade name	: Wacom
Model number	: CTL-470, CTH-470, CTH-670
Serial number	: 1DDPS00009, 1DDPS00012, 1DDPS00029
EUT condition	: Pre-production
Max. frequency	: 48MHz
Power ratings	: DC 5V (USB)
Size	: (W) 278 x (D) 176 x (H) 9.8 mm (CTL-470) (W) 278 x (D) 176 x (H) 9.8 mm (CTH-470) (W) 351.8 x (D) 209 x (H) 9.8 mm (CTH-670)
Environment	: Indoor use
Thermal limitation	: 5°C to 40°C
Operating mode	: Normal Operation
Variation of the family model(s)	: N/A
[RF Specification]	
Frequency Range	: 667.0kHz
Modulation method	: OOK (On-Off-Keying)
RF emission type designator	: 81K4K1D (CTL-470), 81K8K1D (CTH-470), 82K0K1D (CTH-670)

### ***2.3 Operating mode***

#### **【Normal Operation】**

- i) Tablet test set up
- ii) Select a Packet measurement
- iii) Start test mode

### 3. Configuration information

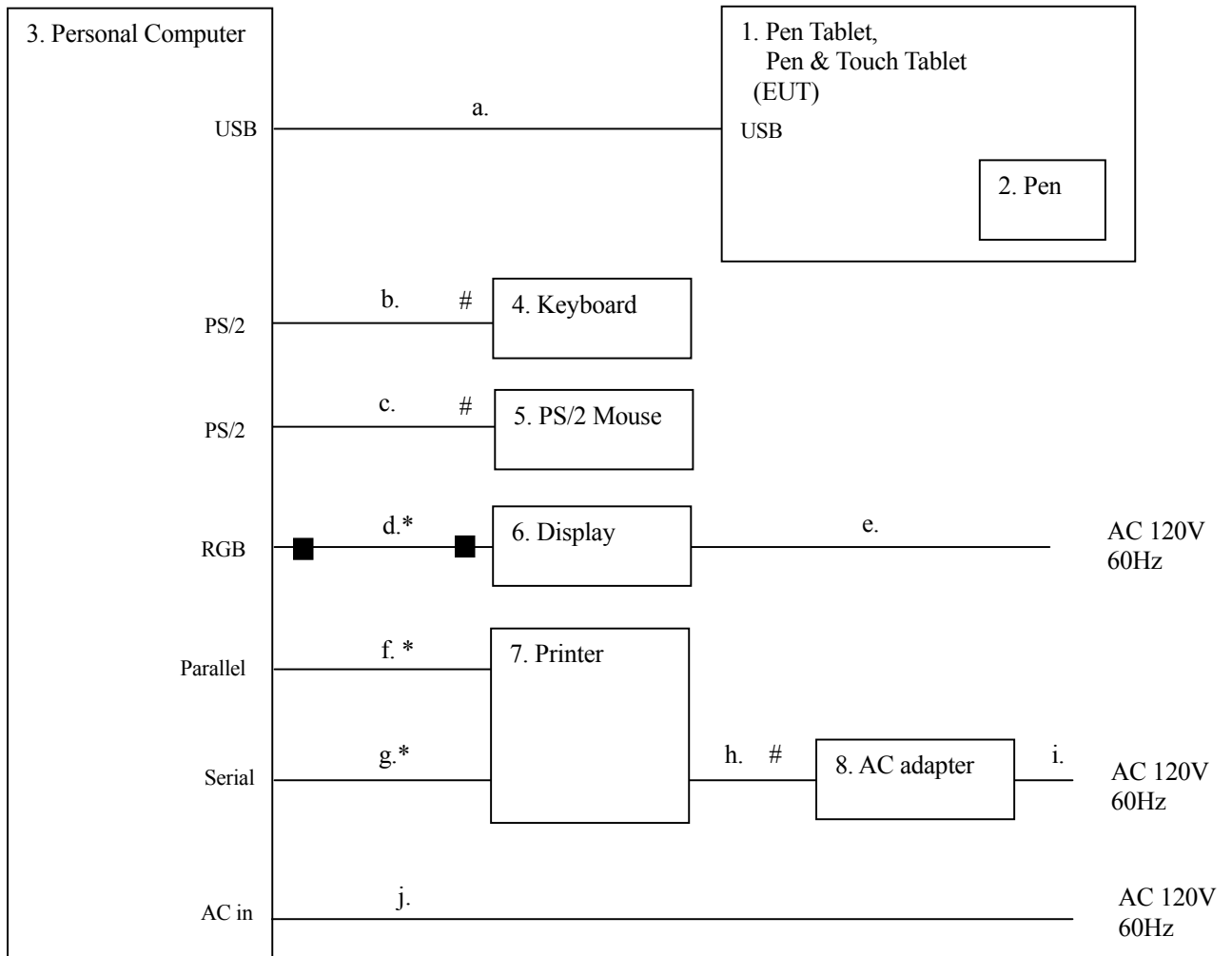
#### 3.1 EUT and Peripheral(s) used

No.	Equipment	Company	Model No.	Serial No.	FCC ID/DoC	Comment
1	Pen Tablet, Pen & Touch Tablet	Wacom	CTL-470	1DDPS00009	FCC ID: HV4CTH670 IC:6888A-CTH670	EUT
			CTH-470	1DDPS00012		
			CTH-670	1DDPS00029		
2	Pen	Wacom	LP-170	N/A	-	Accessory
			LP-170E	N/A	-	Accessory
3	Personal Computer	DELL	Xw4400	JPA7190B2L	DoC	-
4	Keyboard	DELL	SK-8110	N/A	DoC	-
5	PS/2 Mouse	DELL	MO71KC	441068648	DoC	-
6	Display	DELL	E176FPc	CN-0MC042-64 180-657-0V0K	DoC	-
7	Printer	SII	DPU-414	1000169	DoC	-
8	AC adapter for Printer	SII	PW-4007-JU1-E	0948	-	-

#### 3.2 Cable(s) information

No.	Cable	Length [m]	Shield	Connector	Comment
a	USB cable	1.0	Yes	Metal	Accessory
b	Keyboard cable	2.0	No	Metal	-
c	Mouse cable	1.8	Yes	Metal	-
d	RGB cable	1.5	Yes	Metal	-
e	AC power cord for Display	1.8	No	Plastic	-
f	Parallel cable	2.1	Yes	Metal	-
g	Serial cable	3.5	Yes	Metal	-
h	DC cable for Printer AC adapter	1.9	No	Plastic	-
i	AC power cord for Printer AC adapter	2.0	No	Plastic	-
j	AC power cord for PC	1.8	No	Plastic	-

### 3.3 System configuration



# : Un-detachable cable  
 ■ : Ferrite core  
 \* : Bundled excess cable

Note1: Numbers assigned to equipment or cables on this diagram are corresponded to the list in “3.1 EUT and Peripheral(s) used” and “3.2 Cable(s) information”.

Note2: RGB cable(No.d) with two ferrite cores is accessory for Display(No.6).

## **4. Test Type and Results**

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### **4.1 99% Occupied Bandwidth**

#### **4.1.1 Test Procedure [ IC RSS-Gen 4.6.1 ]**

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99% bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

The spectrum analyzer is set to:

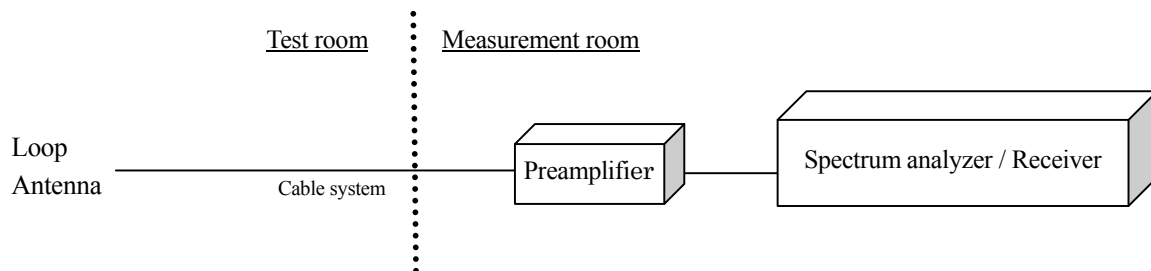
- RBW=3kHz, VBW=10kHz, Span=300kHz, Sweep=auto

The test mode of EUT is as follows.

- Normal Operation

#### **4.1.2 Measurement Setup**

##### **Test configuration for 99% Occupied Bandwidth**



#### **4.1.3 Limit of Bandwidth at 99% Occupied Bandwidth**

None



#### 4.1.4 Measurement Result

##### [CTL-470]

Pen	Frequency [MHz]	Occupied Bandwidth [kHz]
LP-170	0.667	81.0225
LP-170E	0.667	81.3951

##### [CTH-470]

Pen	Frequency [MHz]	Occupied Bandwidth [kHz]
LP-170	0.667	81.8292
LP-170E	0.667	81.3872

##### [CTH-670]

Pen	Frequency [MHz]	Occupied Bandwidth [kHz]
LP-170	0.667	81.5486
LP-170E	0.667	81.9870

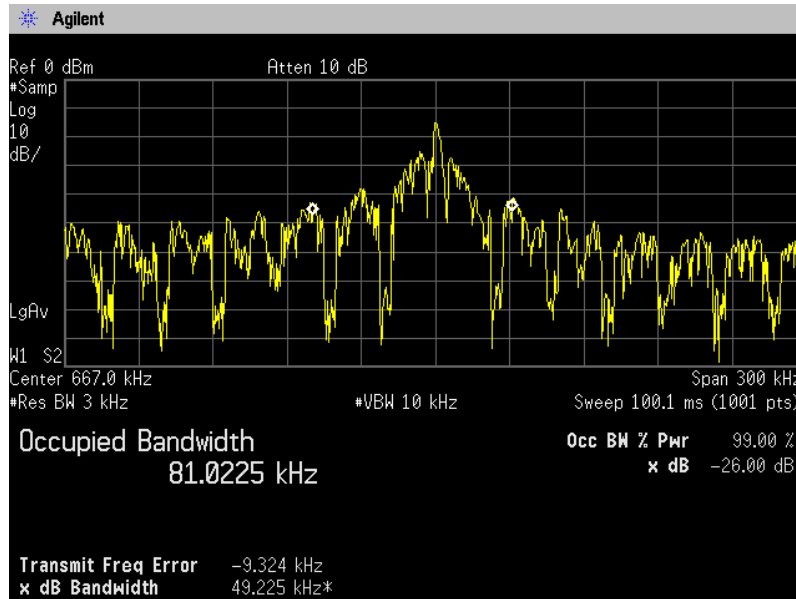
### 4.1.5 Trace Data

**Test Personnel:**

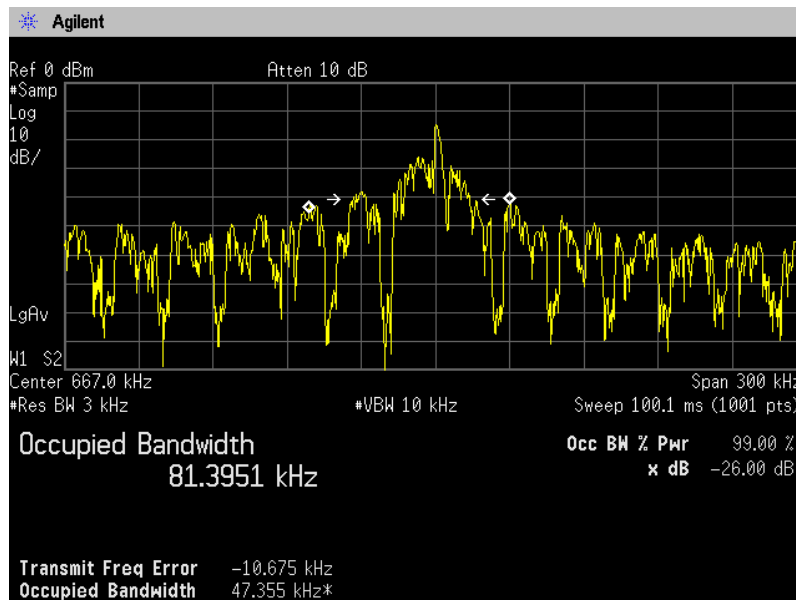
Tested by: Chiaki Kanno

Date : May 26, 2011  
Temperature : 21.0 [°C]  
Humidity : 44.3 [%]  
Test place : 3m Semi-anechoic chamber

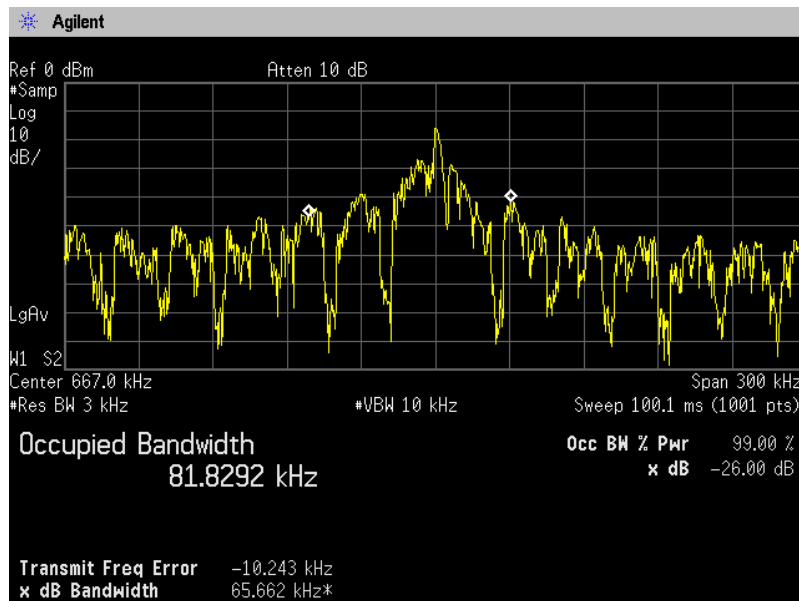
**[CTL-470] Pen: LP-170**



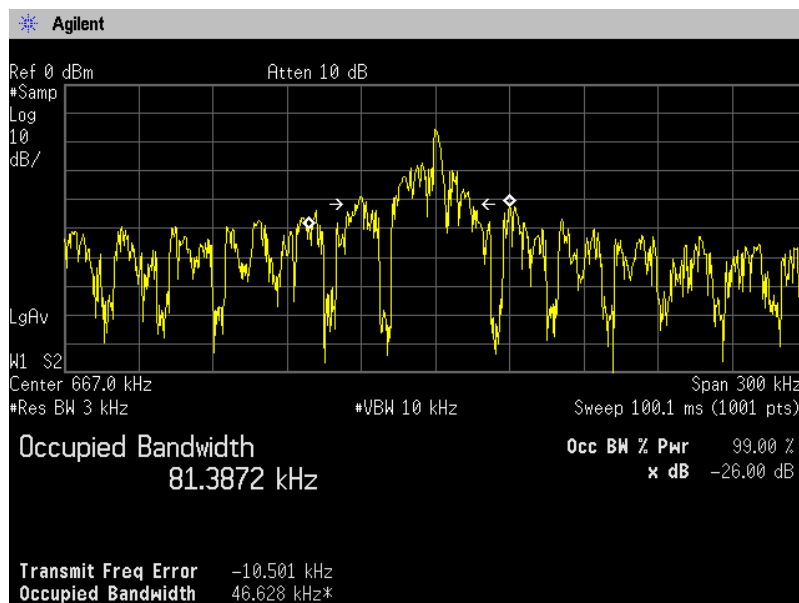
**[CTL-470] Pen: LP-170E**



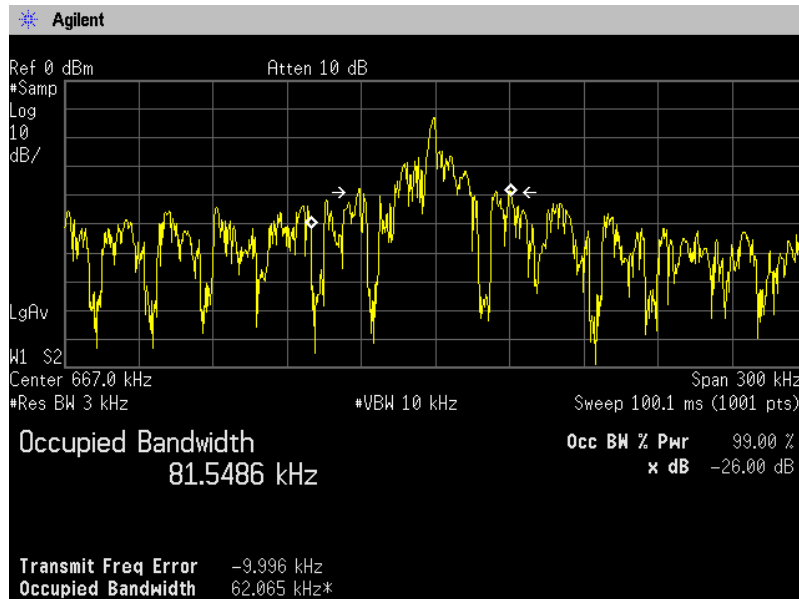
[CTH-470] Pen: LP-170



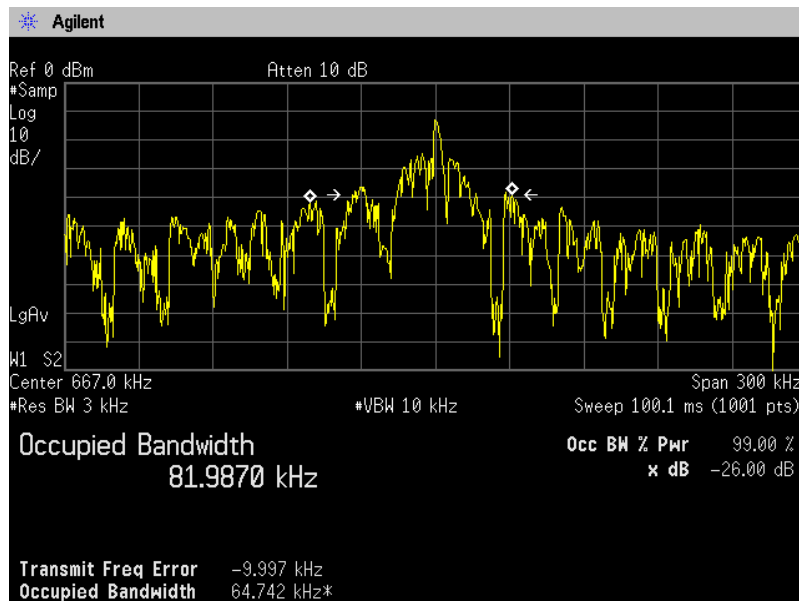
[CTH-470] Pen: LP-170E



[CTH-670] Pen: LP-170



[CTH-670] Pen: LP-170E



## 4.2 Radiated Emissions (9kHz to 30MHz)

### 4.2.1 Test Procedure [ FCC 15.209, IC RSS-210 A2.2, RSS-Gen 4.9, 4.10, 4.11 ]

Radiated emission measurements are performed at 3m distance with the Loop antenna. The antenna is positioned with its plane vertical, and the center of the Loop is 1.0meter above the ground plane. Frequency Range: 9kHz to 30MHz is scanned and investigated with the test receiver. The detector function of the test receiver is set to CISPR Quasi-peak mode and the bandwidth is set to 200Hz (9kHz to 150kHz) and 9kHz (150kHz to 30MHz). The EUT and support equipment are placed on a 1 meter x 2.0 meter surface, 0.8 meter height FRP table. The turntable and the loop antenna are rotated by 360 degrees and stopped at azimuth of producing the maximum emission. Interconnecting cables, which hanging closer than 40cm to the horizontal metal ground plane are bundled its excess in center. The test results represent the worst-case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation. Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

Frequency range:

- 9kHz to 30MHz

The Test receiver is set to:

Detector: Quasi-peak

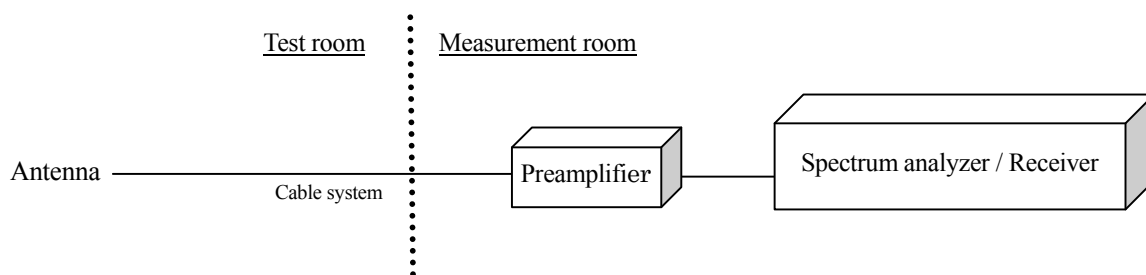
Bandwidth: 200Hz, 9kHz

The test mode of EUT is as follows.

- Normal Operation

### 4.2.2 Measurement Setup

#### Test configuration for Radiated emissions



### 4.2.3 Limit of Spurious Emission Measurement

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	500	54.0	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level [dBuV/m] = 20 log Emission [uV/m]
3. Measurements were corrected to 30m using  $40\log(3/30) = -40.0\text{dB}$

### 4.2.4 Calculation Method

Emission level = Reading + c.f.(Ant. factor + Cable system loss – Amp. Gain)

Margin = Limit – Emission level

### 4.2.5 Measurement Results

**Test Personnel:**

Tested by: Chiaki Kanno

Date : May 25, 2010  
 Temperature : 21.0 [°C]  
 Humidity : 44.3 [%]  
 Test place : 3m Semi-anechoic chamber

**[CTL-470] Pen: LP-170**

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	49.4	-10.6	38.8	-1.2	31.1	32.3	PASS
1.334	34.9	-10.5	24.4	-15.6	25.1	40.7	PASS
2.001	37.3	-10.2	27.1	-12.9	29.5	42.4	PASS
2.668	34.4	-10.2	24.2	-15.8	29.5	45.3	PASS

**[CTL-470] Pen: LP-170E**

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	49.3	-10.6	38.7	-1.3	31.1	32.4	PASS
1.334	34.9	-10.5	24.4	-15.6	25.1	40.7	PASS
2.001	37.4	-10.2	27.2	-12.8	29.5	42.3	PASS
2.668	34.5	-10.2	24.3	-15.7	29.5	45.2	PASS

**[CTH-470] Pen: LP-170**

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	49.5	-10.6	38.9	-1.1	31.1	32.2	PASS
1.334	34.8	-10.5	24.3	-15.7	25.1	40.8	PASS
2.001	37.2	-10.2	27.0	-13.0	29.5	42.5	PASS
2.668	34.5	-10.2	24.3	-15.7	29.5	45.2	PASS

**[CTH-470] Pen: LP-170E**

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	49.4	-10.6	38.8	-1.2	31.1	32.3	PASS
1.334	34.9	-10.5	24.4	-15.6	25.1	40.7	PASS
2.001	37.3	-10.2	27.1	-12.9	29.5	42.4	PASS
2.668	34.4	-10.2	24.2	-15.8	29.5	45.3	PASS

**[CTH-670] Pen: LP-170**

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	-10.6	41.0	1.0	31.1	30.1	PASS
1.334	34.7	-10.5	24.2	-15.8	25.1	40.9	PASS
2.001	38.1	-10.2	27.9	-12.1	29.5	41.6	PASS
2.668	34.5	-10.2	24.3	-15.7	29.5	45.2	PASS

**[CTH-670] Pen: LP-170E**

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	52.0	-10.6	41.4	1.4	31.1	29.7	PASS
1.334	34.9	-10.5	24.4	-15.6	25.1	40.7	PASS
2.001	37.9	-10.2	27.7	-12.3	29.5	41.8	PASS
2.668	34.3	-10.2	24.2	-15.8	29.5	45.3	PASS



### 4.3 Radiated Emissions (30MHz to 1000MHz)

#### 4.3.1 Test Procedure [ FCC 15.209, IC RSS-210 A2.2, RSS-Gen 4.9, 4.10, 4.11 ]

Radiated emission measurements are performed at 10m distance with the Biconical antenna and Log periodic antenna.

The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1 to 4 meters and stopped at height producing the maximum emission. Frequency Range: 30MHz to 1000MHz is scanned and investigated with the test receiver. The detector function of the test receiver is set to CISPR Quasi-peak mode and the bandwidth is set to 120kHz.

The EUT and support equipment are placed on a 1 meter x 2.0 meter surface, 0.8 meter height FRP table. The turntable and the loop antenna are rotated by 360 degrees and stopped at azimuth of producing the maximum emission.

Interconnecting cables, which hanging closer than 40cm to the horizontal metal ground plane are bundled its excess in center. The test results represent the worst-case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation.

Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

Frequency range:

- 30MHz to 1000MHz

The Test receiver is set to:

Detector: Quasi-peak

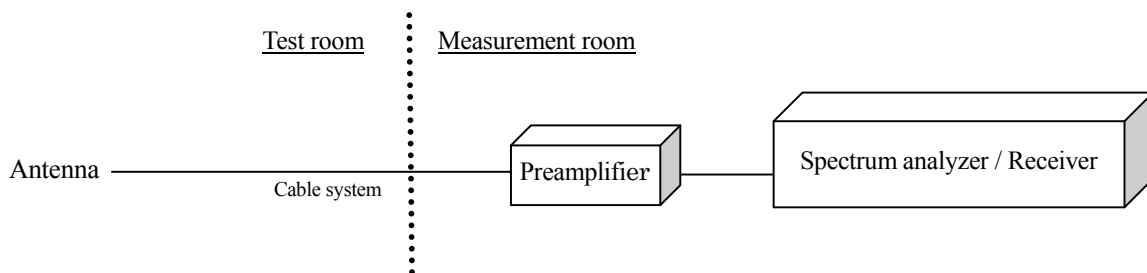
Bandwidth: 120kHz

The test mode of EUT is as follows.

- Normal Operation

#### 4.3.2 Measurement Setup

##### Test configuration for Radiated emissions



### 4.3.3 Limit of Spurious Emission Measurement

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

NOTE:

1. CISPR 22 limit was applied to Radiated emission measurements as prescribed in FCC part 15 section 15.109(g).
2. Emission level [dBuV/m] = 20 log Emission [uV/m]

### 4.3.4 Calculation Method

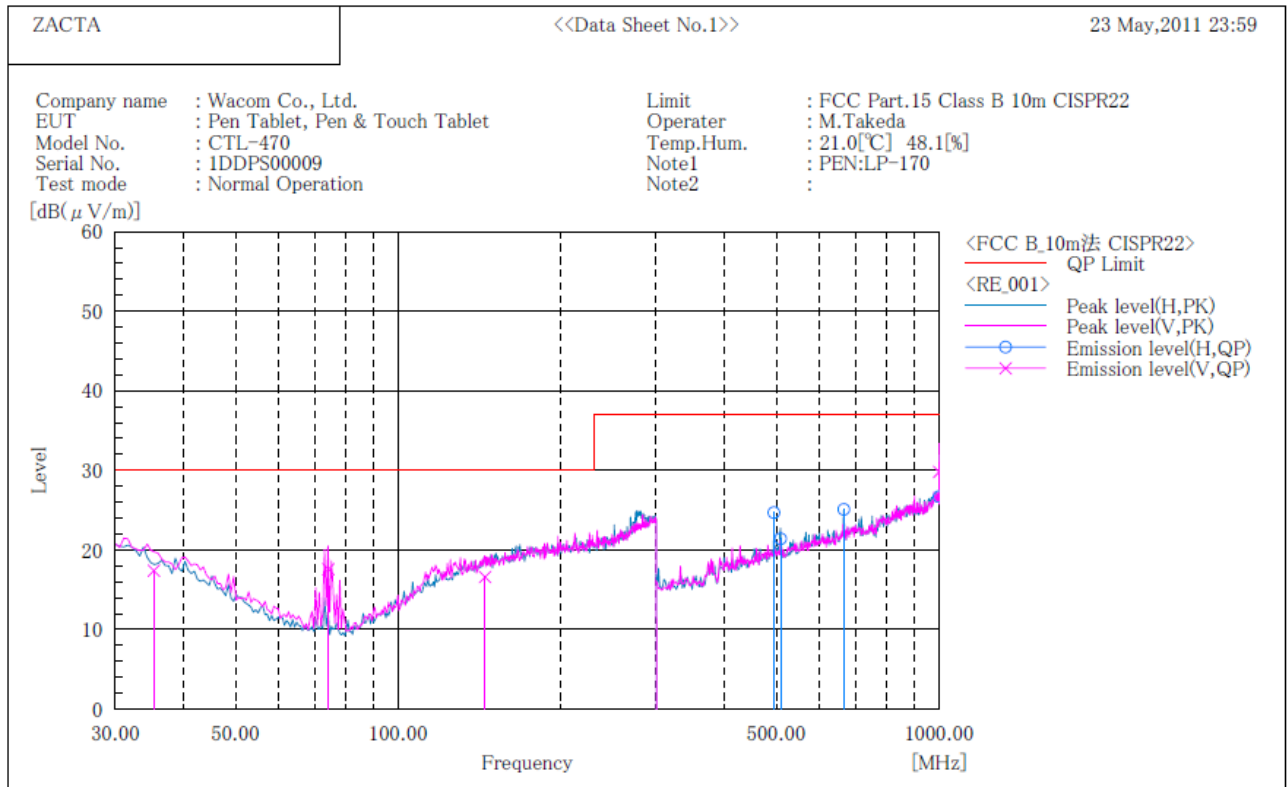
Emission level = Reading + c.f.(Ant. factor + Cable system loss – Amp. Gain)

Margin = Limit – Emission level

### 4.3.5 Measurement Results

[CTL-470]

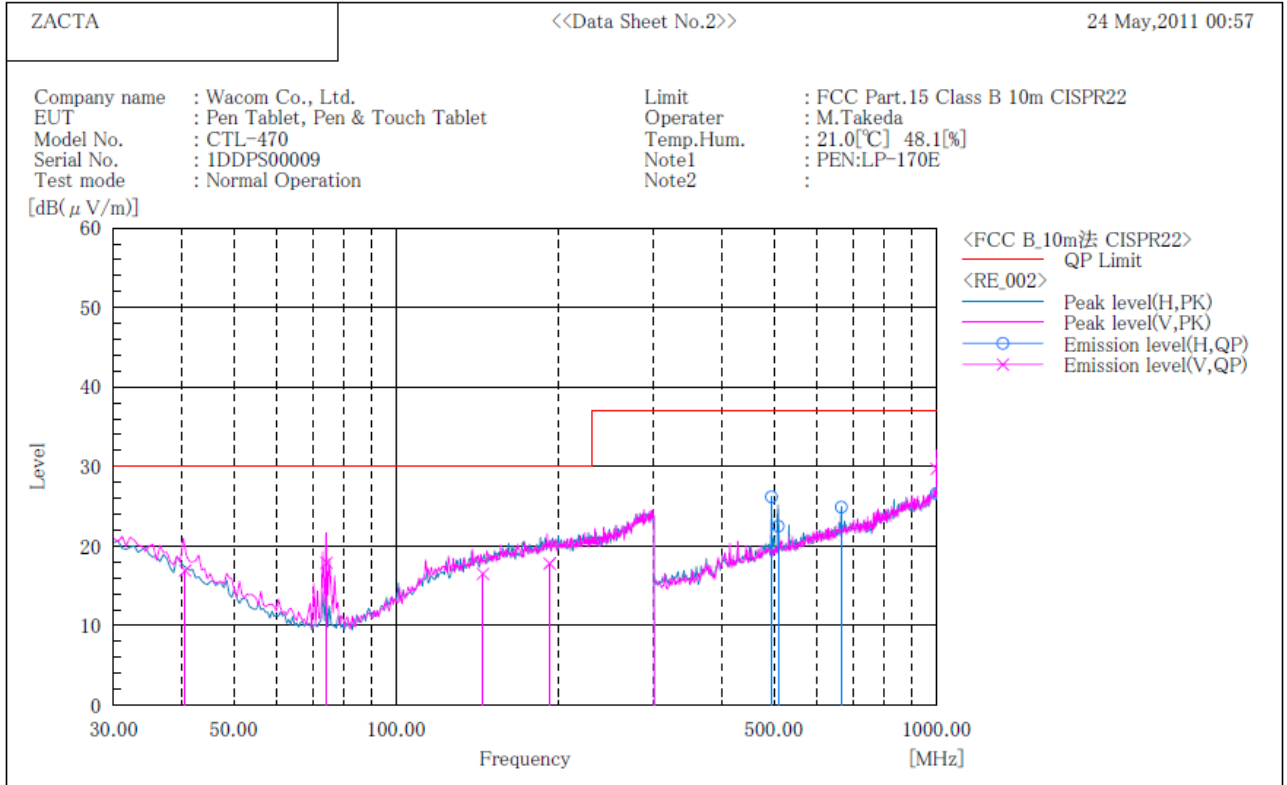
\*\*\*\*\* RADIATED EMISSION \*\*\*\*\*  
[ 10m Semi-anechoic chamber ]



#### Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c. f [dB(1/m)]	Result QP [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
1	35.333	V	24.2	-6.8	17.4	30.0	12.6	100.0	4.0
2	74.290	V	33.5	-15.9	17.6	30.0	12.4	164.0	260.0
3	144.760	V	23.7	-7.1	16.6	30.0	13.4	100.0	0.0
4	494.997	H	31.0	-6.3	24.7	37.0	12.3	189.0	213.0
5	509.386	H	27.5	-6.1	21.4	37.0	15.6	161.0	205.0
6	666.682	H	28.8	-3.7	25.1	37.0	11.9	100.0	163.0
7	1000.000	H	25.5	1.2	26.7	37.0	10.3	220.0	191.0
8	1000.000	V	28.6	1.2	29.8	37.0	7.2	135.0	288.0

\*\*\*\*\* RADIATED EMISSION \*\*\*\*\*  
[ 10m Semi-anechoic chamber ]

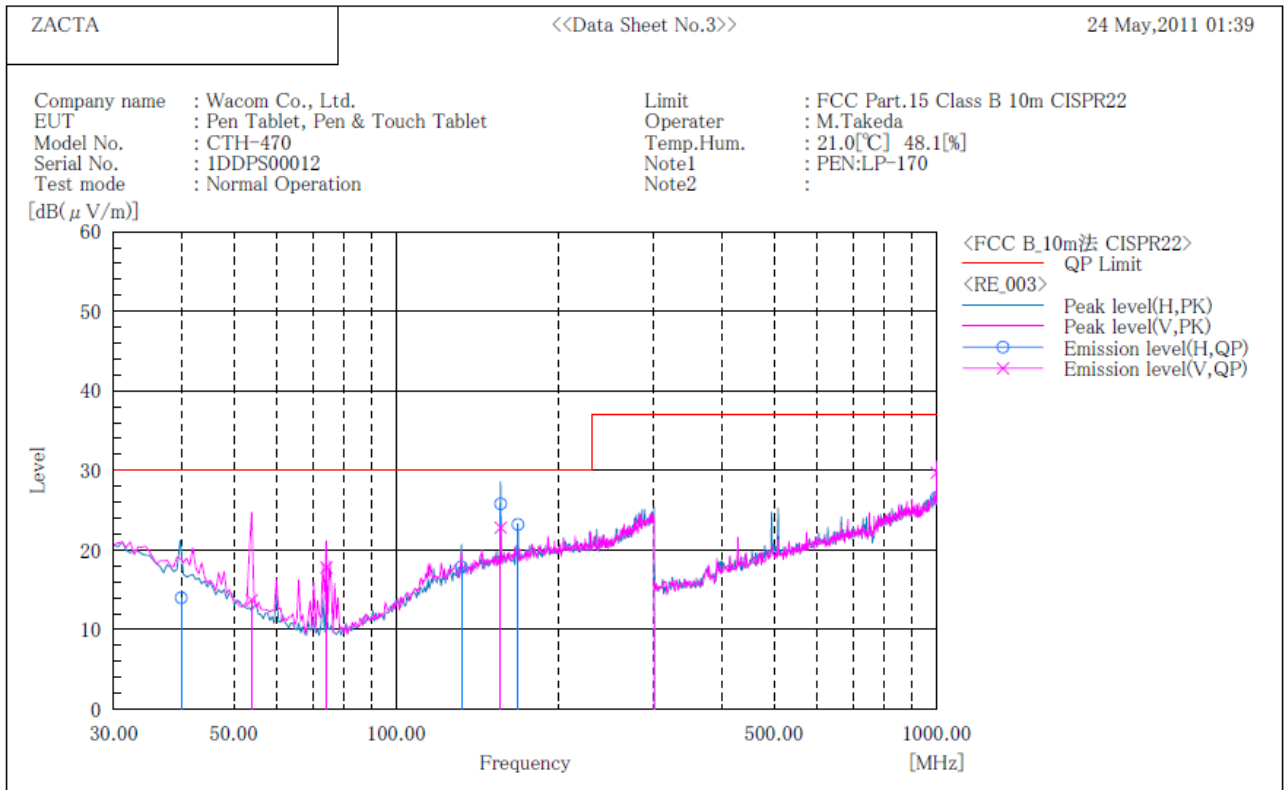


Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c. f [dB(1/m)]	Result QP [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
1	40.687	V	25.5	-8.6	16.9	30.0	13.1	100.0	292.0
2	74.288	V	33.8	-15.9	17.9	30.0	12.1	163.0	164.0
3	144.760	V	23.6	-7.1	16.5	30.0	13.5	100.0	270.0
4	192.272	V	23.1	-5.3	17.8	30.0	12.2	100.0	294.0
5	495.000	H	32.5	-6.3	26.2	37.0	10.8	184.0	214.0
6	509.386	H	28.6	-6.1	22.5	37.0	14.5	164.0	209.0
7	666.688	H	28.6	-3.7	24.9	37.0	12.1	100.0	175.0
8	1000.000	V	28.5	1.2	29.7	37.0	7.3	138.0	292.0
9	1000.000	H	25.4	1.2	26.6	37.0	10.4	228.0	202.0

[CTH-470]

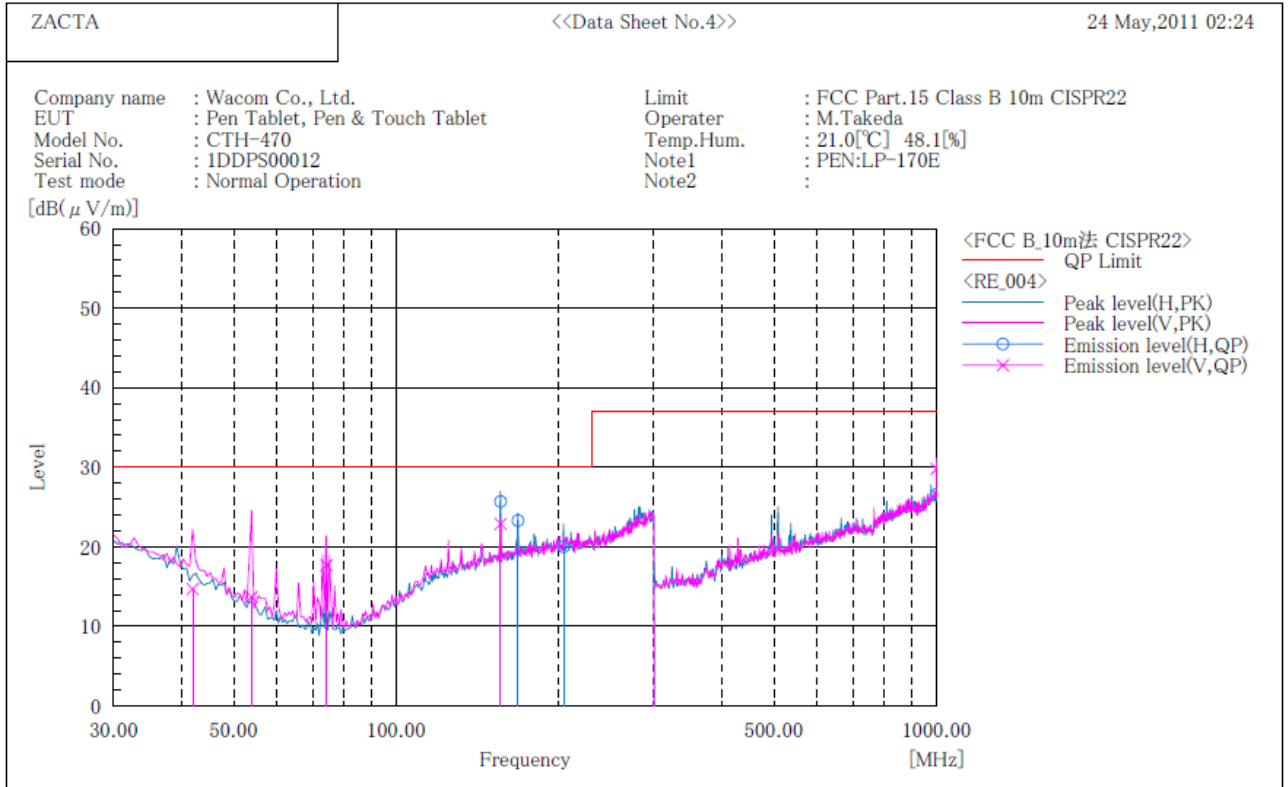
\*\*\*\*\* RADIATED EMISSION \*\*\*\*\*  
[ 10m Semi-anechoic chamber ]



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c. f [dB(1/m)]	Result QP [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
1	39.990	H	22.4	-8.4	14.0	30.0	16.0	400.0	207.0
2	53.991	V	26.8	-13.1	13.7	30.0	16.3	100.0	37.0
3	74.292	V	33.7	-15.9	17.8	30.0	12.2	163.0	191.0
4	131.997	H	25.9	-8.0	17.9	30.0	12.1	400.0	162.0
5	156.002	V	29.5	-6.7	22.8	30.0	7.2	100.0	201.0
6	156.003	H	32.5	-6.7	25.8	30.0	4.2	296.0	312.0
7	167.998	H	29.4	-6.2	23.2	30.0	6.8	400.0	284.0
8	1000.000	V	28.5	1.2	29.7	37.0	7.3	128.0	294.0
9	1000.000	H	25.4	1.2	26.6	37.0	10.4	233.0	197.0

\*\*\*\*\* RADIATED EMISSION \*\*\*\*\*  
[ 10m Semi-anechoic chamber ]

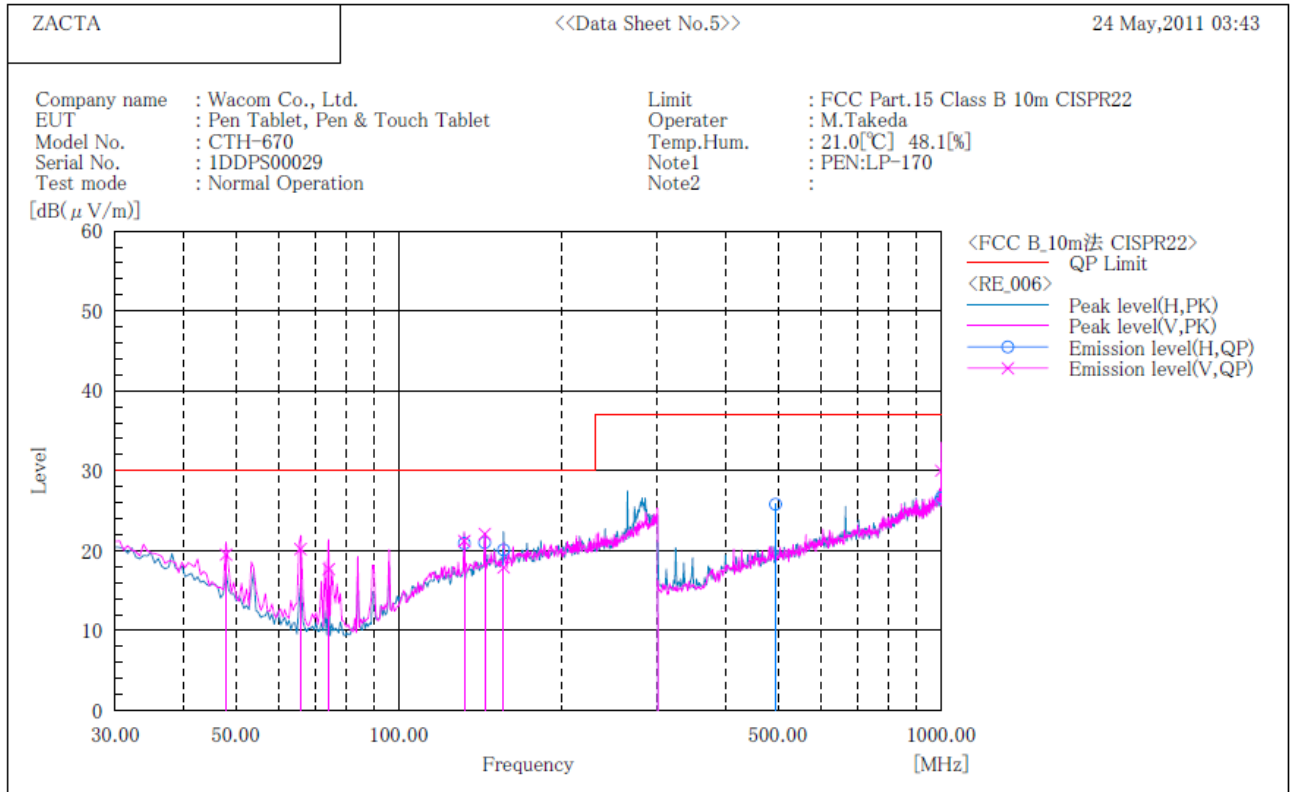


Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c. f [dB(1/m)]	Result QP [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
1	42.012	V	23.8	-9.1	14.7	30.0	15.3	100.0	237.0
2	53.997	V	26.8	-13.1	13.7	30.0	16.3	100.0	0.0
3	74.290	V	33.6	-15.9	17.7	30.0	12.3	165.0	195.0
4	156.000	V	29.6	-6.7	22.9	30.0	7.1	100.0	230.0
5	156.004	H	32.4	-6.7	25.7	30.0	4.3	100.0	320.0
6	168.000	H	29.5	-6.2	23.3	30.0	6.7	301.0	293.0
7	203.993	H	25.0	-5.0	20.0	30.0	10.0	373.0	276.0
8	1000.000	V	28.6	1.2	29.8	37.0	7.2	130.0	286.0
9	1000.000	H	25.4	1.2	26.6	37.0	10.4	236.0	188.0

[CTH-670]

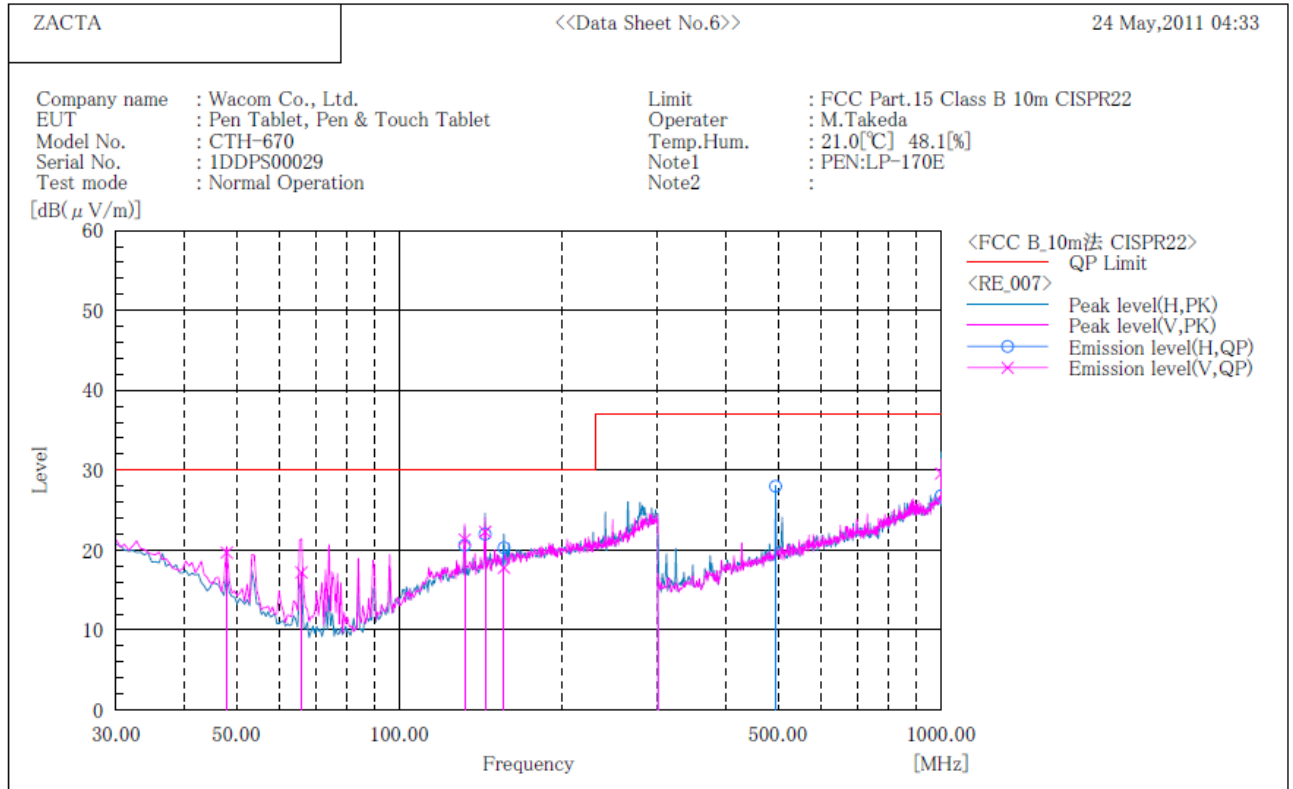
\*\*\*\*\* RADIATED EMISSION \*\*\*\*\*  
[ 10m Semi-anechoic chamber ]



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
1	48.001	V	30.6	-11.1	19.5	30.0	10.5	100.0	292.0
2	65.836	V	35.5	-15.3	20.2	30.0	9.8	140.0	69.0
3	74.295	V	33.6	-15.9	17.7	30.0	12.3	168.0	176.0
4	132.004	H	28.9	-8.0	20.9	30.0	9.1	400.0	215.0
5	132.007	V	29.2	-8.0	21.2	30.0	8.8	100.0	274.0
6	143.997	V	29.4	-7.3	22.1	30.0	7.9	100.0	265.0
7	144.004	H	28.3	-7.3	21.0	30.0	9.0	400.0	62.0
8	156.001	H	26.8	-6.7	20.1	30.0	9.9	400.0	309.0
9	156.005	V	24.6	-6.7	17.9	30.0	12.1	100.0	223.0
10	495.000	H	32.1	-6.3	25.8	37.0	11.2	186.0	214.0
11	1000.000	V	28.8	1.2	30.0	37.0	7.0	125.0	290.0
12	1000.000	H	25.4	1.2	26.6	37.0	10.4	228.0	193.0

\*\*\*\*\* RADIATED EMISSION \*\*\*\*\*  
[ 10m Semi-anechoic chamber ]



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c. f [dB(1/m)]	Result QP [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
1	48.000	V	30.8	-11.1	19.7	30.0	10.3	100.0	300.0
2	66.003	V	32.5	-15.3	17.2	30.0	12.8	152.0	72.0
3	132.000	V	29.3	-8.0	21.3	30.0	8.7	100.0	88.0
4	132.008	H	28.6	-8.0	20.6	30.0	9.4	400.0	221.0
5	144.000	V	29.6	-7.3	22.3	30.0	7.7	100.0	265.0
6	144.000	H	29.3	-7.3	22.0	30.0	8.0	400.0	315.0
7	156.005	V	24.5	-6.7	17.8	30.0	12.2	100.0	216.0
8	156.007	H	27.0	-6.7	20.3	30.0	9.7	400.0	128.0
9	495.000	H	34.3	-6.3	28.0	37.0	9.0	161.0	210.0
10	1000.000	V	28.4	1.2	29.6	37.0	7.4	126.0	296.0
11	1000.000	H	25.6	1.2	26.8	37.0	10.2	220.0	198.0



#### 4.4 AC power line Conducted Emissions

##### 4.4.1 Test Procedure [ FCC 15.207, IC RSS-Gen 7.2.4 ]

Conducted emission at AC mains port measurements are performed at open area test site according to ANSI C63.4 section 7.

EUT and support equipment are placed on FRP table of 2.0m(W) × 1.0m(D) × 0.8m(H) in size. EUT is connected to 50Ω/50μH Line impedance stabilization network (LISN) which is placed on reference ground plane, and was placed 80cm away from EUT. Excess of AC power cable is bundled in center. Vertical Metal Reference Plane 2.0m (W) × 2.0m (H) in size is placed 0.4m away from EUT. 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, support equipment, 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, support equipment and test equipment are provided in order for them to warm up to their normal operating condition.

Frequency range:

- 0.15MHz to 30MHz

The Test receiver is set to:

Detector: Quasi-peak, Average

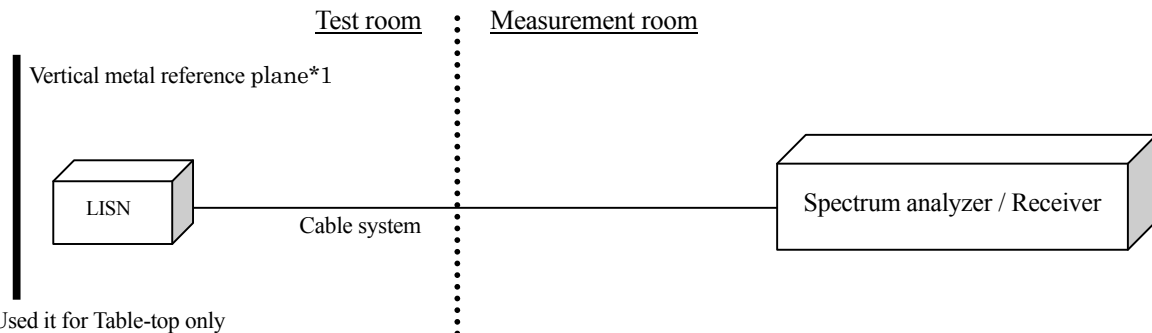
Bandwidth: 9kHz

The test mode of EUT is as follows.

- Normal Operation

##### 4.4.2 Measurement Setup

###### Test configuration for AC power line Conducted Emissions



\*1: Used it for Table-top only

#### ***4.4.3 Limit of AC power line Conducted Emissions Measurement***

Frequency	Limit	
	QP(dBμV)	AV(dBμV)
0.15MHz to 0.5MHz	66 to 56*	56 to 46*
0.5MHz to 5MHz	56	46
5MHz to 30MHz	60	50

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

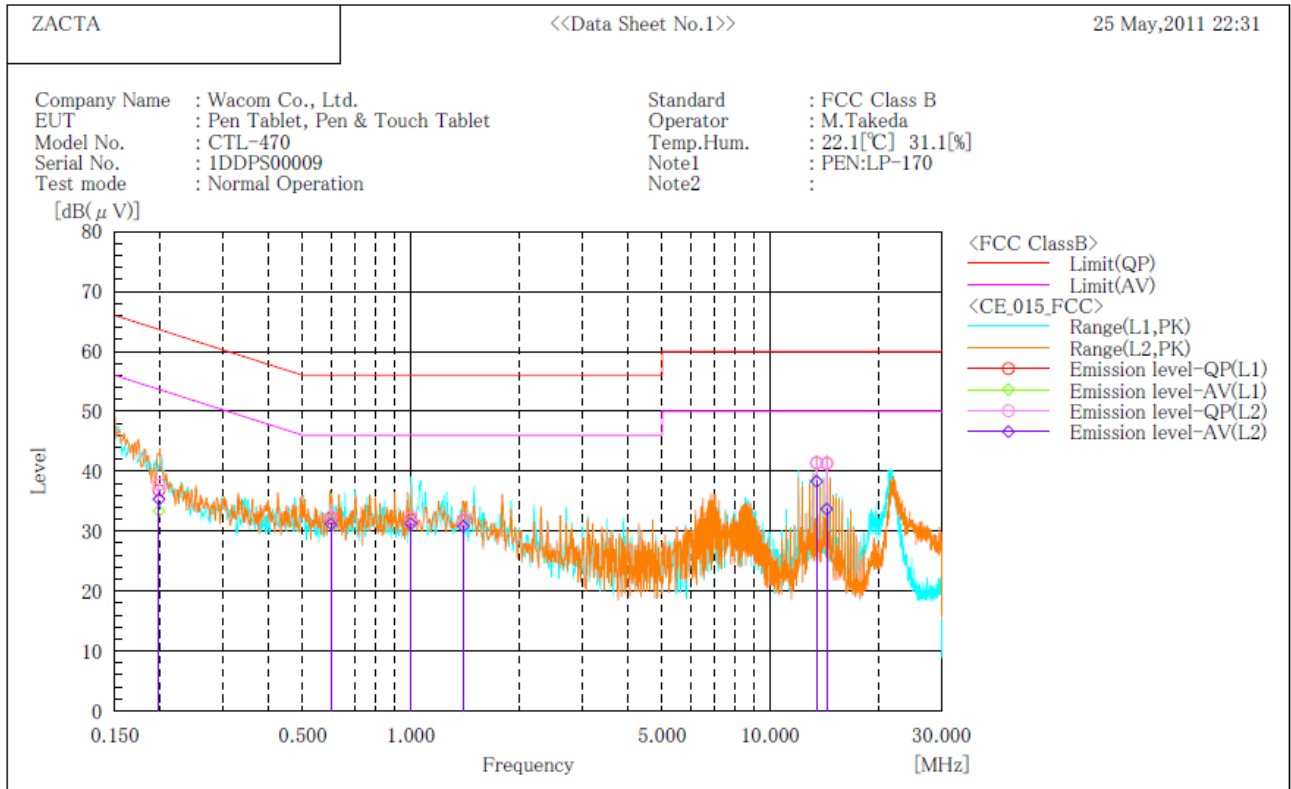
#### ***4.4.4 Calculation method***

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

Margin = Limit – Emission level

**4.4.5 Measurement Result**  
**[CTL-470]**

\*\*\*\*\* CONDUCTED EMISSION at MAINS PORT \*\*\*\*\*  
<< 10m Semi-anechoic chamber >>



**Final Result**

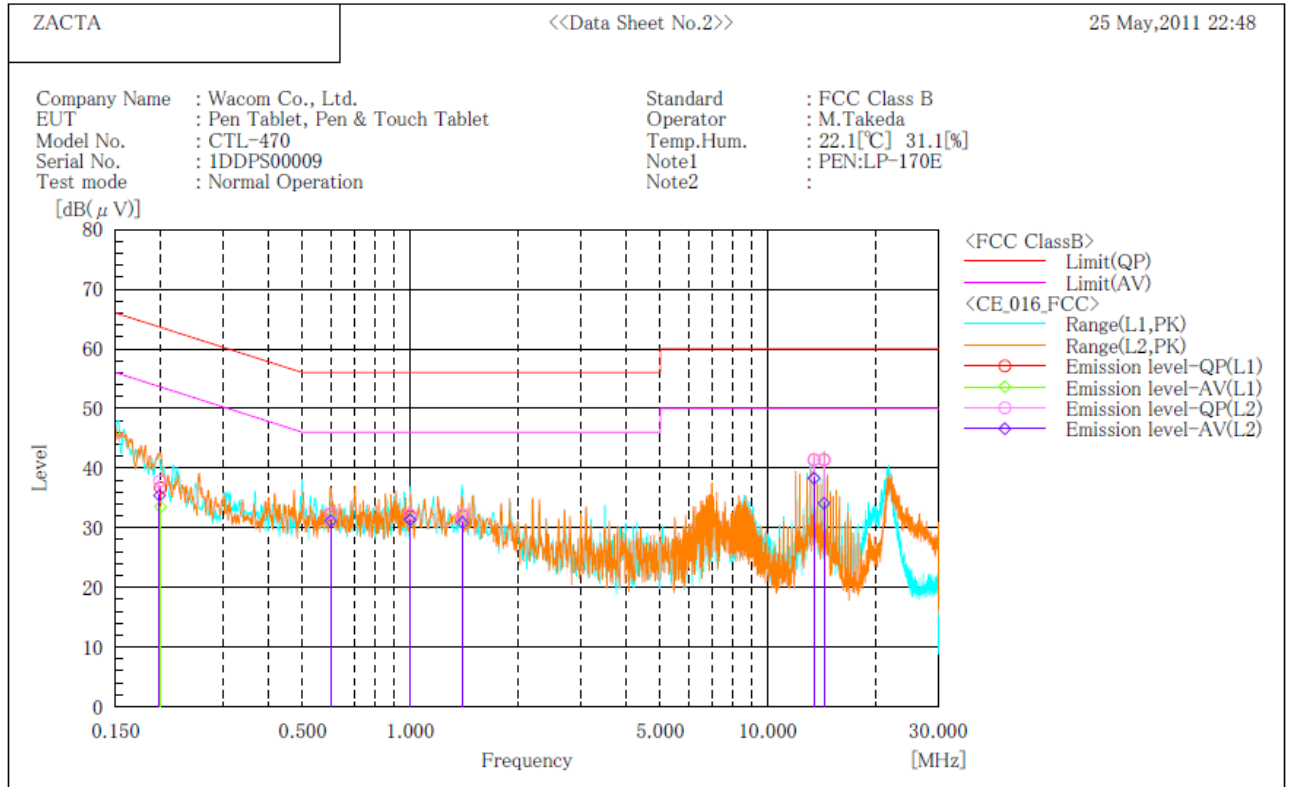
--- L1 Phase ---

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	0.199	26.8	23.4	10.0	36.8	33.4	63.7	53.7	26.9	20.3
2	0.600	22.2	21.3	10.0	32.2	31.3	56.0	46.0	23.8	14.7
3	0.999	21.9	21.1	10.0	31.9	31.1	56.0	46.0	24.1	14.9
4	1.399	21.7	20.8	10.1	31.8	30.9	56.0	46.0	24.2	15.1
5	13.462	30.6	27.5	10.8	41.4	38.3	60.0	50.0	18.6	11.7
6	14.359	30.5	23.0	10.8	41.3	33.8	60.0	50.0	18.7	16.2

--- 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	0.199	27.8	25.3	10.0	37.8	35.3	63.7	53.7	25.9	18.4
2	0.599	22.4	21.2	10.0	32.4	31.2	56.0	46.0	23.6	14.8
3	0.999	22.1	21.2	10.0	32.1	31.2	56.0	46.0	23.9	14.8
4	1.399	21.8	20.7	10.1	31.9	30.8	56.0	46.0	24.1	15.2
5	13.462	30.6	27.5	10.8	41.4	38.3	60.0	50.0	18.6	11.7
6	14.360	30.5	22.9	10.8	41.3	33.7	60.0	50.0	18.7	16.3

\*\*\*\*\* CONDUCTED EMISSION at MAINS PORT \*\*\*\*\*  
<< 10m Semi-anechoic chamber >>



Final Result

--- L1 Phase ---

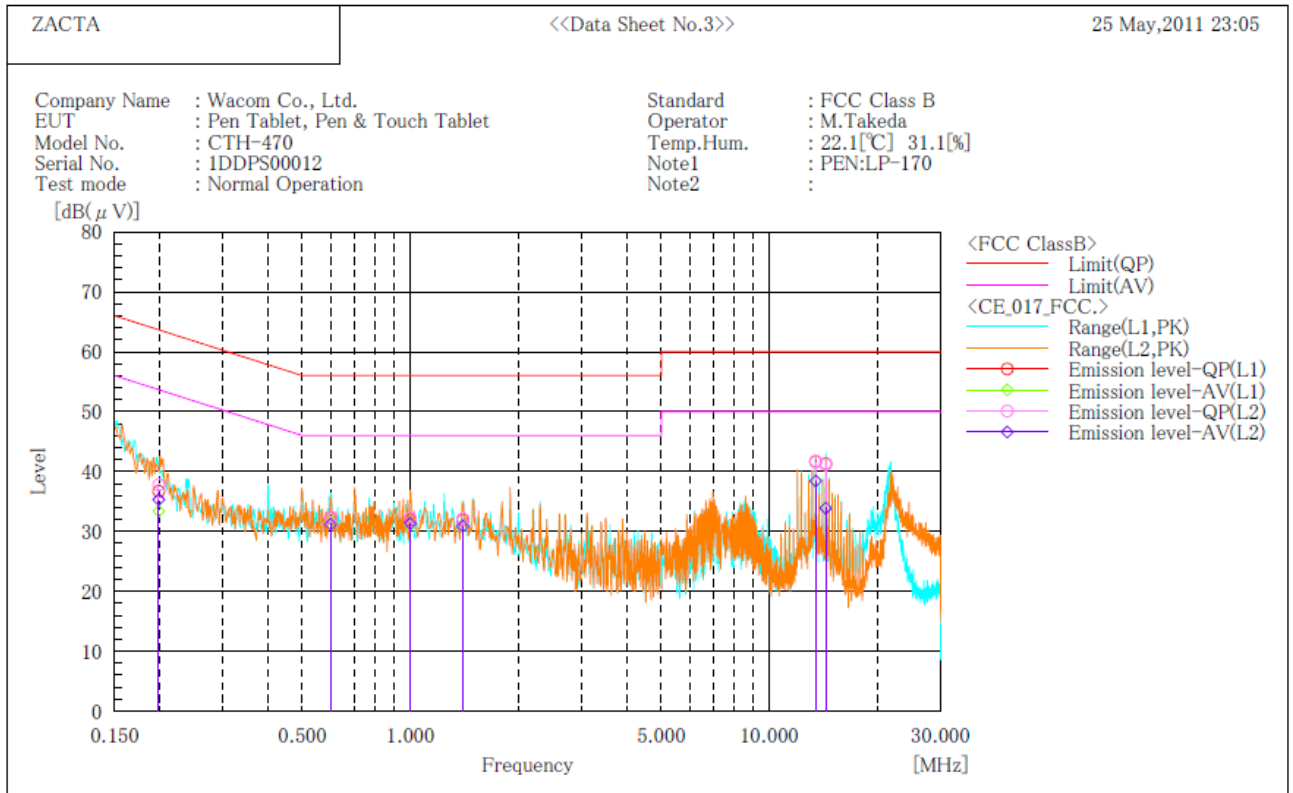
No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.200	26.7	23.5	10.0	36.7	33.5	63.6	53.6	26.9	20.1
2	0.599	22.3	21.4	10.0	32.3	31.4	56.0	46.0	23.7	14.6
3	0.999	21.9	21.1	10.0	31.9	31.1	56.0	46.0	24.1	14.9
4	1.399	21.9	20.9	10.1	32.0	31.0	56.0	46.0	24.0	15.0
5	13.462	30.6	27.5	10.8	41.4	38.3	60.0	50.0	18.6	11.7
6	14.359	30.6	23.1	10.8	41.4	33.9	60.0	50.0	18.6	16.1

--- 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	0.199	27.8	25.4	10.0	37.8	35.4	63.7	53.7	25.9	18.3
2	0.599	22.4	21.2	10.0	32.4	31.2	56.0	46.0	23.6	14.8
3	0.999	22.2	21.3	10.0	32.2	31.3	56.0	46.0	23.8	14.7
4	1.399	22.0	20.8	10.1	32.1	30.9	56.0	46.0	23.9	15.1
5	13.462	30.6	27.5	10.8	41.4	38.3	60.0	50.0	18.6	11.7
6	14.359	30.6	23.3	10.8	41.4	34.1	60.0	50.0	18.6	15.9

[CTH-470]

\*\*\*\*\* CONDUCTED EMISSION at MAINS PORT \*\*\*\*\*  
<< 10m Semi-anechoic chamber >>



Final Result

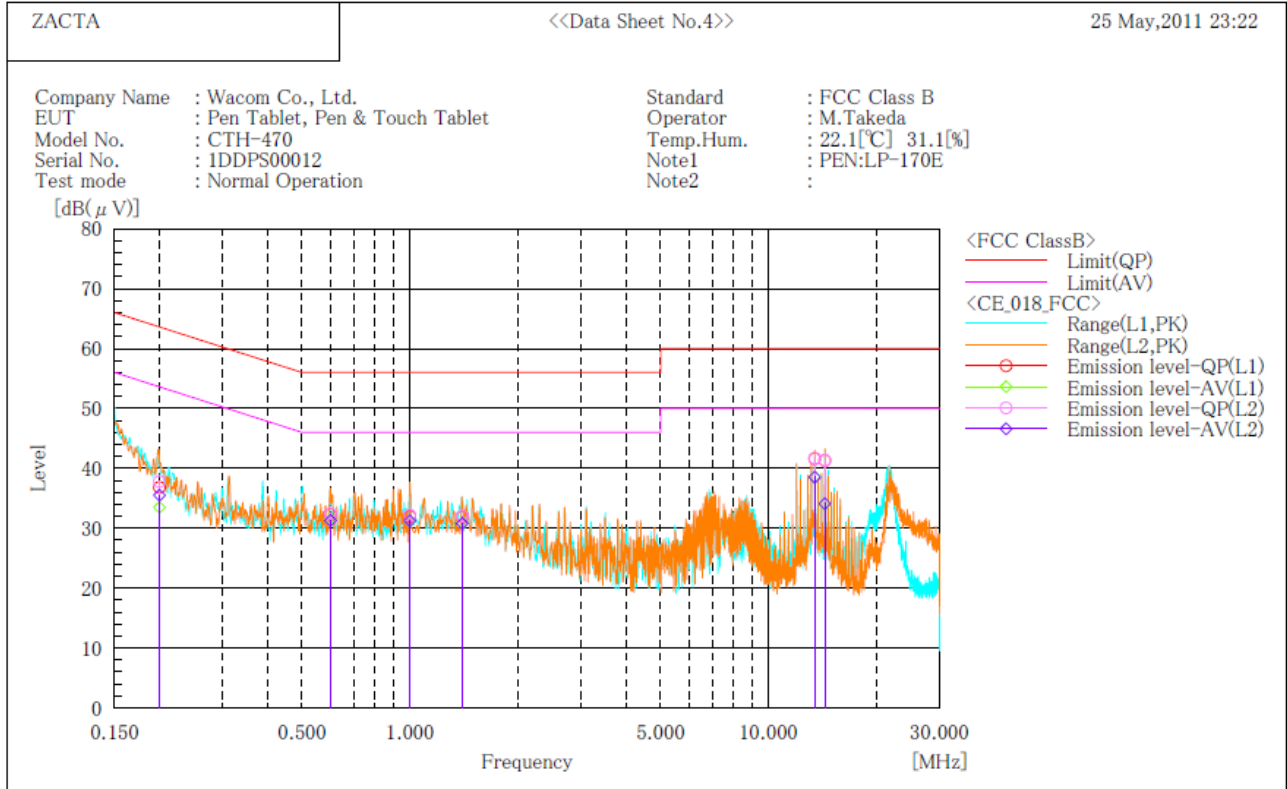
--- L1 Phase ---

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	0.199	26.7	23.4	10.0	36.7	33.4	63.7	53.7	27.0	20.3
2	0.599	22.3	21.4	10.0	32.3	31.4	56.0	46.0	23.7	14.6
3	0.999	22.0	21.1	10.0	32.0	31.1	56.0	46.0	24.0	14.9
4	1.399	21.8	20.9	10.1	31.9	31.0	56.0	46.0	24.1	15.0
5	13.462	30.9	27.7	10.8	41.7	38.5	60.0	50.0	18.3	11.5
6	14.359	30.5	23.2	10.8	41.3	34.0	60.0	50.0	18.7	16.0

--- 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	0.199	27.8	25.3	10.0	37.8	35.3	63.7	53.7	25.9	18.4
2	0.599	22.4	21.2	10.0	32.4	31.2	56.0	46.0	23.6	14.8
3	0.999	22.2	21.3	10.0	32.2	31.3	56.0	46.0	23.8	14.7
4	1.399	22.0	20.8	10.1	32.1	30.9	56.0	46.0	23.9	15.1
5	13.462	30.8	27.6	10.8	41.6	38.4	60.0	50.0	18.4	11.6
6	14.359	30.4	23.1	10.8	41.2	33.9	60.0	50.0	18.8	16.1

\*\*\*\*\* CONDUCTED EMISSION at MAINS PORT \*\*\*\*\*  
<< 10m Semi-anechoic chamber >>



Final Result

--- L1 Phase ---

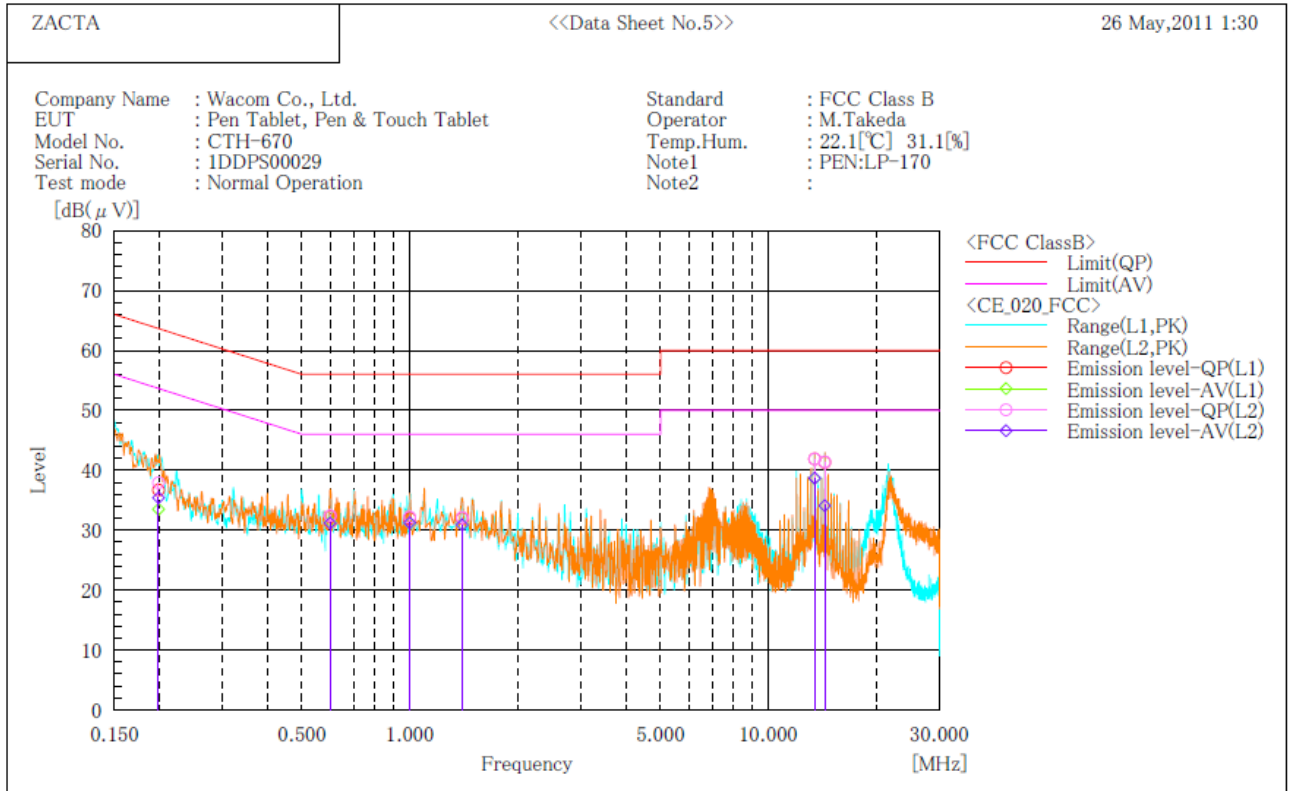
No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.200	26.8	23.5	10.0	36.8	33.5	63.6	53.6	26.8	20.1
2	0.599	22.3	21.4	10.0	32.3	31.4	56.0	46.0	23.7	14.6
3	0.999	22.0	21.1	10.0	32.0	31.1	56.0	46.0	24.0	14.9
4	1.399	21.8	20.9	10.1	31.9	31.0	56.0	46.0	24.1	15.0
5	13.461	30.8	27.8	10.8	41.6	38.6	60.0	50.0	18.4	11.4
6	14.359	30.5	23.2	10.8	41.3	34.0	60.0	50.0	18.7	16.0

--- 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	0.200	27.8	25.5	10.0	37.8	35.5	63.6	53.6	25.8	18.1
2	0.600	22.4	21.3	10.0	32.4	31.3	56.0	46.0	23.6	14.7
3	0.999	22.2	21.2	10.0	32.2	31.2	56.0	46.0	23.8	14.8
4	1.399	21.9	20.7	10.1	32.0	30.8	56.0	46.0	24.0	15.2
5	13.462	30.9	27.7	10.8	41.7	38.5	60.0	50.0	18.3	11.5
6	14.359	30.5	23.3	10.8	41.3	34.1	60.0	50.0	18.7	15.9

[CTH-670]

\*\*\*\*\* CONDUCTED EMISSION at MAINS PORT \*\*\*\*\*  
<< 10m Semi-anechoic chamber >>



Final Result

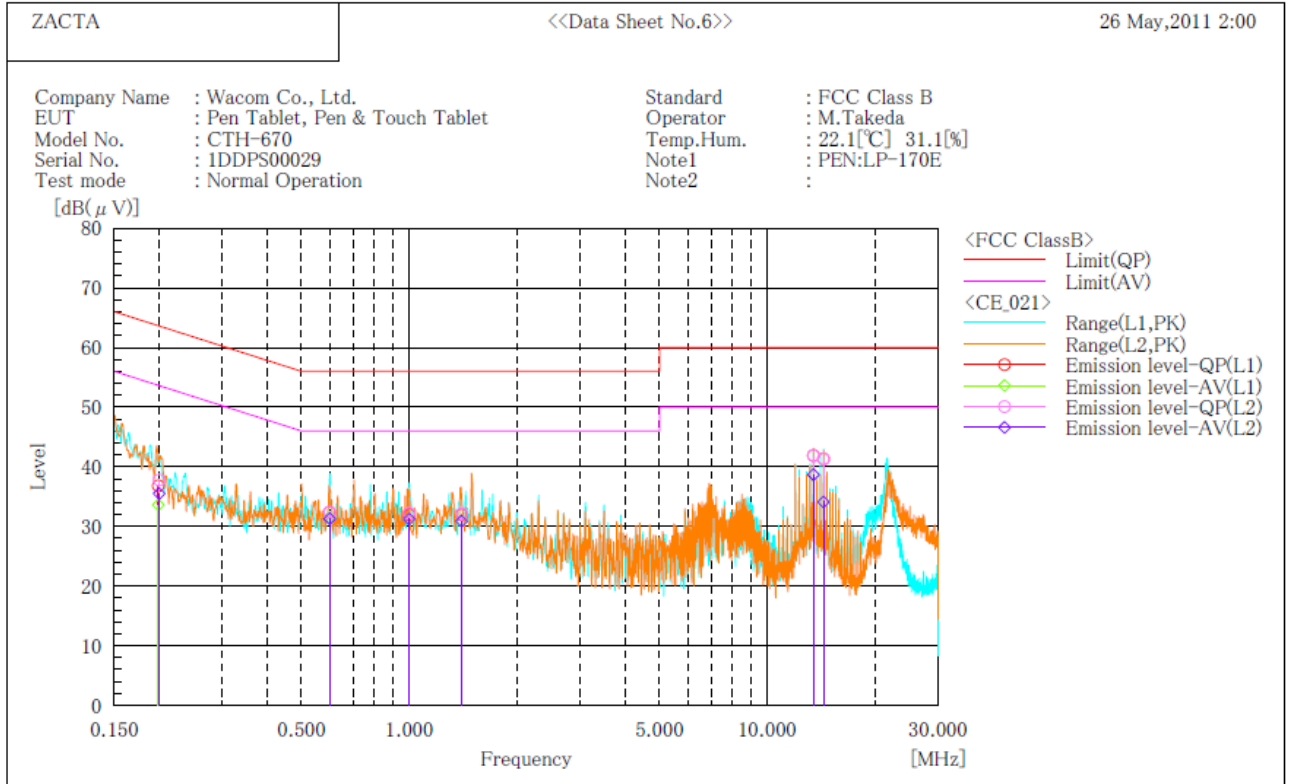
--- L1 Phase ---

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	0.199	26.7	23.5	10.0	36.7	33.5	63.7	53.7	27.0	20.2
2	0.600	22.3	21.4	10.0	32.3	31.4	56.0	46.0	23.7	14.6
3	0.999	22.0	21.1	10.0	32.0	31.1	56.0	46.0	24.0	14.9
4	1.399	21.9	20.9	10.1	32.0	31.0	56.0	46.0	24.0	15.0
5	13.462	31.1	27.8	10.8	41.9	38.6	60.0	50.0	18.1	11.4
6	14.359	30.5	23.3	10.8	41.3	34.1	60.0	50.0	18.7	15.9

--- 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	0.199	27.9	25.4	10.0	37.9	35.4	63.7	53.7	25.8	18.3
2	0.599	22.4	21.2	10.0	32.4	31.2	56.0	46.0	23.6	14.8
3	0.999	22.2	21.2	10.0	32.2	31.2	56.0	46.0	23.8	14.8
4	1.399	22.0	20.8	10.1	32.1	30.9	56.0	46.0	23.9	15.1
5	13.462	31.1	27.9	10.8	41.9	38.7	60.0	50.0	18.1	11.3
6	14.359	30.6	23.3	10.8	41.4	34.1	60.0	50.0	18.6	15.9

\*\*\*\*\* CONDUCTED EMISSION at MAINS PORT \*\*\*\*\*  
<< 10m Semi-anechoic chamber >>



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	0.199	26.8	23.6	10.0	36.8	33.6	63.7	53.7	26.9	20.1
2	0.599	22.4	21.5	10.0	32.4	31.5	56.0	46.0	23.6	14.5
3	0.999	22.0	21.2	10.0	32.0	31.2	56.0	46.0	24.0	14.8
4	1.399	21.9	20.9	10.1	32.0	31.0	56.0	46.0	24.0	15.0
5	13.462	31.1	27.8	10.8	41.9	38.6	60.0	50.0	18.1	11.4
6	14.359	30.5	23.3	10.8	41.3	34.1	60.0	50.0	18.7	15.9

--- 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	0.200	27.8	25.5	10.0	37.8	35.5	63.6	53.6	25.8	18.1
2	0.599	22.4	21.3	10.0	32.4	31.3	56.0	46.0	23.6	14.7
3	0.999	22.2	21.2	10.0	32.2	31.2	56.0	46.0	23.8	14.8
4	1.399	22.0	20.8	10.1	32.1	30.9	56.0	46.0	23.9	15.1
5	13.462	31.1	27.9	10.8	41.9	38.7	60.0	50.0	18.1	11.3
6	14.359	30.5	23.3	10.8	41.3	34.1	60.0	50.0	18.7	15.9



## ***5. Uncertainty of measurement***

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Expanded uncertainties stated were calculated with a coverage Factor  $k=2$ .  
Please note that these results are not taken into account when determining compliance or non-compliance with test result.

<b>Test item</b>	<b>Measurement uncertainty</b>
Conducted emission at mains port (150kHz - 30MHz)	$\pm 2.9\text{dB}$
Radiated emission (9kHz - 30MHz)	$\pm 4.4\text{dB}$
Radiated emission (30MHz – 1000MHz)	$\pm 4.5\text{dB}$
Radiated emission (1000MHz – 26GHz)	$\pm 3.9\text{dB}$

## 6. Laboratory description

---

**1. Location:** ZACTA Technology Corporation 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) FCC filing:

Site name	Registration Number	Expiry Date
Site 2, Site3	91065	November 19, 2011
3m Semi-anechoic chamber 10m Semi-anechoic chamber	540072	February 16, 2013

3) Industry Canada Oats site filing:

Site name	Sites on file: Oats 3m/10m	Expiry Date
Site 2	4224A-2	February 16, 2012
Site 3	4224A-3	February 16, 2012
3m Semi-anechoic chamber	4224A-4	February 16, 2012
10m Semi-anechoic chamber	4224A-5	February 16, 2012

4) VCCI site filing:

Site name	Radiated emission	Conducted Emission for mains port	Expiry Date	Conducted emission for telecom port	Expiry Date
Site 2	R-137	C-133	Nov. 16, 2011	T-1477	Oct. 8, 2011
Site 3	R-138	C-134	Nov. 16, 2011	T-1478	Oct. 8, 2011
10m Semi-anechoic chamber	R-2480	C-2722	Jul. 3, 2011	T-1474	Oct. 8, 2011
3m Semi-anechoic chamber	R-2481	C-2723	Jul. 3, 2011	T-1475	Oct. 8, 2011
Shielded room No.1	R-137	C-2724	Jul. 3, 2011	T-1476	Oct. 8, 2011

5) ETL SEMKO authorization:

Authorized as an EMC test laboratory.

6) TUV Rheinland authorization:

Authorized as an EMC test laboratory.

7) BUREAU VERITAS certification:

Certified as an EMC test laboratory.

## Appendix A: Test equipment

### Radiated Emission (9kHz to 30MHz)

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
Spectrum Analyzer	Agilent Technologies	E4447A	MY46180188	Feb. 2012	Feb. 23, 2011
Preamplifier	ANRITSU	MH648A	M96057	Jun. 2011	Jun. 12, 2010
EMI Receiver	ROHDE&SCHWARZ	ESCI	100765	Jun. 2011	Jun. 9, 2010
Loop antenna	ROHDE&SCHWARZ	HFH2-Z2	891847/17	Feb.2012	Feb. 21, 2011
Microwave cable	SUHNER	SUCOFLEX104/9m	322083/4	Oct. 2011	Oct. 6, 2010
		SUCOFLEX104/1m	322084/4	Oct. 2011	Oct. 6, 2010
		SUCOFLEX104/1.5m	317226/4	Oct. 2011	Oct. 6, 2010
		SUCOFLEX106/7m	41625/6	Oct. 2011	Oct. 6, 2010
PC	DELL	DIMENSION E521	75465BX	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V3.4	N/A	N/A
3m Semi-anechoic chamber	TOKIN	N/A	N/A (9002-NSA)	May 2011	May. 18, 2010

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

### Radiated Emission (30MHz to 1000MHz)

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
Preamplifier	ANRITSU	MH648A	M08067	Jun. 2011	Jun. 12, 2010
EMI Receiver	ROHDE&SCHWARZ	ESCI	100451	May 2011	May 28, 2010
Biconical antenna	Schwarzbeck	VHA9103/BBA9106	1627	Jun. 2011	Jun. 12, 2010
Log periodic antenna	Schwarzbeck	UHALP9108A	0437	Jun. 2011	Jun. 12, 2010
Attenuator	TME	CFA-01NPJ-6	N/A (S273)	Jun. 2011	Jun. 12, 2010
Attenuator	TME	CFA-01NPJ-3	N/A (S270)	Jun. 2011	Jun. 12, 2010
Microwave cable	SUHNER	SUCOFLEX104/9m	322082/4	Sep. 2011	Sep. 14, 2010
		SUCOFLEX104/1m	322085/4	Sep. 2011	Sep. 14, 2010
		SUCOFLEX104/1.5m	317222/4	Sep. 2011	Sep. 14, 2010
		SUCOFLEX106/12m	41624/6	Sep. 2011	Sep. 14, 2010
PC	DELL	DIMENSION E521	85465BX	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V3.4	N/A	N/A
10m Semi-anechoic chamber	TOKIN	N/A	N/A (9001-NSA10m)	May 2012	May 21, 2011

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

**Conducted Emission**

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
EMI Receiver	ROHDE&SCHWARZ	ESCI	100451	May 2011	May 28, 2010
Coaxial cable	FUJIKURA	5D-2W/4m	N/A (S189)	Feb. 2012	Feb. 4, 2011
Microwave cable	SUHNER	SUCOFLEX104/1.5m	317222/4	Sep. 2011	Sep. 14, 2010
Coaxial cable	SUHNER	RG214/U/25m	N/A (S191)	Feb. 2012	Feb. 4, 2011
Line impedance Stabilization network for EUT	Kyoritsu Electrical Works, Ltd.	KNW-407F	8-2003-1	Mar. 2012	Mar. 10, 2011
Line impedance Stabilization network for peripheral	Kyoritsu Electrical Works, Ltd.	KNW-242F	8-1973-1	May 2011	May 28, 2010
Attenuator	TYC	BA-PJ-10	N/A (S348)	Apr. 2012	Apr. 26, 2011
50Ω terminator	SUHNER	65-BNC-50-0-7	N/A (S054)	Mar. 2012	Mar. 3, 2011
PC	DELL	DIMENSION E521	85465BX	N/A	N/A
Software	TOYO Corporation	EP5/CE-AJ	0611193/V3.3	N/A	N/A

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