

CERTIFICATION

We hereby certify that:

The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (1992) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Part 15, Subpart C.

Prepared by: Sherry Kuo

Sherry Kuo

Andy Chiu

Andy Chiu

Approved by: George Yao

George Yao

Issued Date : Mar. 13, 2000

Report No. : NEI-FCCB-99228

Company Stamp:



NEUTRON ENGINEERING INC.
20, Alley 50, Lane 119, Dong Hwu Rd.,
P.O. Box 6-158, Nei Hwu,
Taipei, Taiwan
TEL; (02) 2646-5426 FAX; (02) 2646-6815

Table of Contents

1. General Information

1-1	Product Description.....	4
1-2	Related Submittal(s)/Grant(s).....	4
1-3	Tested System Details.....	5
1-4	Test Methodology.....	6
1-5	Test Facility.....	6

2. System Test Configuration

2-1	Justification.....	7
2-2	EUT Exercise Software.....	7
2-3	Special Accessories.....	8
2-4	Equipment Modifications.....	8
2-5	Configuration of Tested System.....	9
Figure	2-1 Configuration of Tested System.....	11

3. Radiated Measurement Photos

Figure	3-1 Radiated Measurement Photos.....	12
--------	--------------------------------------	----

4. Radiated Emission Datas

4-1	Reaiated Emission Data.....	14
4-2	Field Strength Calculation.....	17
4-3	Correction Factor Table VS Frequency.....	19

1. GENERAL INFORMATION

1-1. Product Description

The Wintime Electronics Corp. Model: WP-906 (referred to as the EUT in this report) is a composite system that containing a digitizing tablet associated with a cordless stylus pen and mouse. They are designed as an “ Input Device ” for IBM compatible PC and will be marketed together to the end user in the future.

Intentional Radiator

- (1) The EUT system intentionally generates and emits radio frequency energy by radiation or induction. It means that the digitizing tablet intentionally generates and emits a hopping RF energy at 394 KHz&516KHz (for pen) or 394KHz (for mouse) .

The wireless pen or mouse unit could not operate without the digitizing tablet cooperation (no battery supplied, and considered as a passive device). So the subpart C conformity measurement could only be performed under digitizing tablet associated with wireless pen or mouse. Without RF energy frequency induced, the wireless pen or mouse could not be measured individually.

The power of wireless pen or mouse had no way to supply by itself. It just put it on the digitizing tablet and generates a hopping RF energy by mutual inductance.

1-2. Related Submittal(s) / Grant (s)

The submittal(s) is a separate application for filing the Intentional Radiator compliance testing for a computing device peripheral a digitizing tablet accompanied with a cordless pen and mouse. Relative submittal(s) for Subpart B, unintentional radiator, compliance testing of the EUT has been performed at the same time with this application under Declaration of Conformity.

1-3. Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system (including inserted cards, which have grants) are:

Model No.	FCC ID	Equipment	Cable
WP-906	G54WP906	Digitizing Tablet	Shielded Data Cable. ⁽¹⁾
		Cordless Pen Cordless Mouse	N/A
444	N/A(3)	PC	Shielded Power Cord.
4500DC-E	GWGMULTI82	Monitor	Shielded Data Cable ⁽²⁾ Un-Shielded Power Cord
DPU-414	N/A(3)	Printer	Shielded Parallel Data Cable Un-Shielded Power Cord
DM-1414V	N/A(3)	Modem	Shielded Serial Data Cable Un-Shielded Power Cord
FDA-104GA	F4ZFDA-104GA	Keyboard	Shielded Data Cable

Notes:

(1) EUT submitted for grant.

(2) Monitor's attached video cable without ferrite core.

(3) The support equipment was authorized by declaration of conformity.

1-4. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (1992). Radiated testing was performed at an antenna to EUT distance 1 meters.

1-5. Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the address of No.132-1, Lane 329, Sec. 2, Palain Road Shijr 221, Taipei, Taiwan, R.O.C. of NEUTRON ENGINEERING INC. This site has been fully described in report dated Jan. 25, 1999, submitted to your office, and accepted in a letter dated Sep. 02, 1999(Reg. No. 95335).

2. System Test Configuration

2-1. Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). The digitizing tablet was connected to support equipment-personal computer. Peripherals of PC, such as monitor, keyboard, modem and printer were contained in this system in order to comply with the ANSI C63.4/CISPR22 (1996) Rules requirement. Due to neither the cordless pen nor mouse could operate individually, it was so configured that the wireless pen or mouse stand on the digitizing tablet during the measurement (Subpart C). The PC operated in the default 640X480/31.5KHz VGA Graphic mode. This operated condition was tested and used to collect the included data.

2-2. EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software, contained on a 3-1/2 inch disk, was inserted into driver A and is auto-starting on power-up. Once loaded, the program sequentially exercises each system component in turn. The sequence used is:

1. Read (write) from (to) mass storage device (Disk).
2. Send " H " pattern to video port device (Monitor).
3. Send " H " pattern to parallel port device (Printer).
4. Send " H " pattern to COM1 port device (EUT).
5. Repeated from 2 to 4 continuously.

As the keyboard, mouse, and the digitizer composite system are strictly input devices, no data is transmitted to (from) them during test. They are, however, continuously scanned for data input activity.

2-3. Special Accessories

N/A

2-4. Equipment Modifications

Not available for this EUT intended for grant.

Applicant Signature:

Hanker Hsu

Date:

Mar. 13, 2000

Type/Printed Name:

Hanker Hsu

Position:

Manager

2.5 Configuration of Tested System

The configuration of tested system is described as the block diagram shown in next page Figure 3.1 and details information of I/O cable and power cord connection are tabulated as Table A and B. The monitor is powered from a floor mounted receptacle (referred to as the wall outlet in the previous described) was tested.

TABLE A - Test Equipment

Item	Equipment	Mfr.	Model/Type No.	I/O Port	FCC ID	Remark
E-1	PC	IBM	444		N/A(3)	
E-2	Monitor	Optquest	4500DC-E	VGA Port	GWGMULTI82	
E-3	Digitizing Tablet Cordless Pen Cordless Mouse	Wintime	WP-906	COM1 Port PS/2 Port	G54WP9Ø6	EUT
E-4	Printer	SII	DPU-414	Centronic Port	N/A(3)	
E-5	Modem	ACEEX	DM-1414V	Com2 Port	N/A(3)	
E-6	Keyboard	Forward	FDA-104GA	PS/2 Port	F4ZFDA-104GA	

Remark:

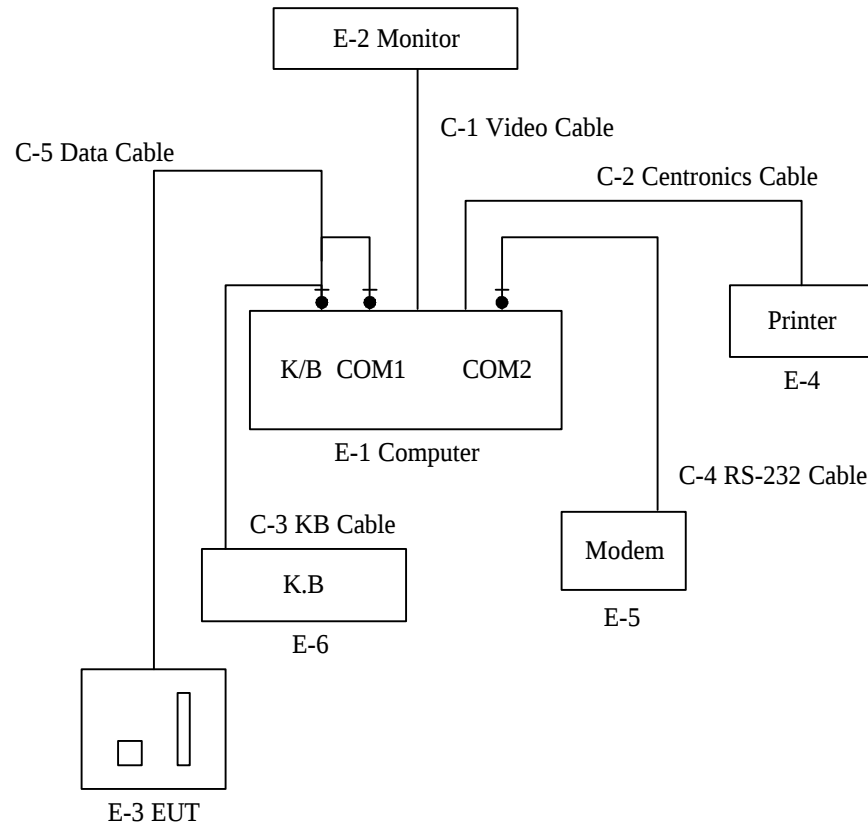
- (1) Unless otherwise denoted as EUT in [Remark] column, device(s) used in tested system is a support equipment.
- (2) Unless otherwise marked as * in [Remark] column, Neutron consigns the supporting equipment(s) to the tested system.
- (3) The support equipment was authorized by Declaration of Confirmation.

Table B. - Informations Cable Information

Item	I/O Cable	Device Connected	Shieded	Ferrite Core	Detachable/Permanently	Length	Note
C-1	VGA Cable	PC-Monitor	Yes	No	Permanently attached on Monitor	150cm	
C-2	Centronics Cable	PC-Printer	Yes	No	Part of Printer, Detachable	200cm	
C-3	Keyboard Cable	PC-Keyboard	Yes	No	Permanently attached on Keyboard	200cm	
C-4	RS-232C Cable	PC-Modem	Yes	No	Part of Modem, Detachable	180cm	
C-5	Data Cable	PC-EUT	Yes	No	Permanently attached on EUT	180cm	*

Note:

- (1) Unless otherwise marked as * in [Remark] colum, Neutron consigns the supporting equipment(s) to the tested system.

Figure 2.1 Configuration of Tested System

3. Radiated Measurement Photos (Pen-Tablet and Cordless Pen)



5. Radiated Measurement Photos (Pen-Tablet and Cordless Mouse)



4 Radiated Emission Datas

4-1-1 The following data lists the significant emission frequencies, measured levels, plus the limit for Subpart C measurement. Explanation of field strength limit calculation is given in page 17/21 and 18/21.

Condition : Test Distance : 1 meter (Mode: Cordless Pen)

Type of Antenna: Loop Antenna

Freq. (KHz)	Frequency Within Band (MHz)	Receiver* Reading in dBuV/m	Factor (dB) Cable Loss	Field Strength (uV/m)	Required Measurement Distance(m)	Limitation Converted 1 m dist. (dBuV/m)	Over Limit
394	0.009-0.49	75.7	0.1	6.09	300	114.78	-38.98
788	0.490	64.4	0.1	30.46	30	88.76	-24.26
1182	↕	44.4	0.1	20.30	30	85.24	-40.74
1576	1.705	48.2	0.1	15.23	30	82.74	-34.44
1970	1.705	44.7	0.2	30.00	30	88.63	-43.73
2364	↕	41.8	0.2	30.00	30	88.63	-46.63
2758	↕	40.3	0.2	30.00	30	88.63	-48.13
3152	↕	37.5	0.3	30.00	30	88.63	-50.83
3546	↕	37.0	0.3	30.00	30	88.63	-51.33
3940	30	37.7	0.3	30.00	30	88.63	-50.63

Remark:

1. All receiver readings (the measured field strength levels) are measured from loop antenna directly.
2. The emission limits shown in the above table are base on measurements employing a quasi-peak dectorexcept for the frequency bands 9-90 KHz, 110-490 KHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average dector.
3. The tighter limit applies at the band edges.

Review:

Andy Chiu

Test Personnel.:

Nelson

Date:

Mar. 1, 2000

4 Radiated Emission Datas

4-1-2 The following data lists the significant emission frequencies, measured levels, plus the limit for subpart C measurement. Explanation of field strength limit calculation is given in page 17/21 and 18/21.

Condition : Test Distance : 1 meter (Cordless Pen)

Type of Antenna: Loop Antenna

Freq. (KHz)	Frequency Within Band (MHz)	Receiver* Reading in dBuV/m	Factor (dB) Cable Loss	Field Strength (uV/m)	Required Measurement Distance(m)	Limitation Converted 1 m dist. (dBuV/m)	Over Limit
516	0.490	90.5	0.1	46.51	30	92.44	-1.94
1032.5	↕	57.1	0.1	23.24	30	86.41	-29.21
1545	1.705	55.5	0.1	15.53	30	82.91	-27.31
2064.9	1.705	50.2	0.2	30.00	30	88.63	-38.23
2573.6	↑	47.3	0.2	30.00	30	88.63	-41.13
3094.3	↑	41.3	0.3	30.00	30	88.63	-47.03
3607.2	↑	38.8	0.3	30.00	30	88.63	-49.53
4129.5	↑	38.2	0.3	30.00	30	88.63	-50.13
4643.2	↓	39.4	0.4	30.00	30	88.63	-48.83
5165.0	30	36.4	0.4	30.00	30	88.63	-51.83

Remark:

1. All receiver readings (the measured field strength levels) are measured from loop antenna directly.
2. The emission limits shown in the above table are base on measurements employing a quasi-peak dectorexcept for the frequency bands 9-90 KHz, 110-490 KHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average dector.
3. The tighter limit applies at the band edges.

Review:

Andy Chiu

Test Personnel.:

Nelson

Date:

Jan. 6, 2000

4 Radiated Emission Datas

4-1-1 The following data lists the significant emission frequencies, measured levels, plus the limit for Subpart C measurement. Explanation of field strength limit calculation is given in page 17/21 and 18/21.

Condition : Test Distance : 1 meter (Mode: Cordless Mouse)

Type of Antenna: Loop Antenna

Freq. (KHz)	Frequency Within Band (MHz)	Receiver* Reading in dBuV/m	Factor (dB) Cable Loss	Field Strength (uV/m)	Required Measurement Distance(m)	Limitation Converted 1 m dist. (dBuV/m)	Over Limit
395	0.009-0.49	77.1	0.1	6.08	300	114.78	-37.56
790	0.490	60.2	0.1	30.38	30	88.74	-28.44
1181	↕	51.1	0.1	20.32	30	85.24	-34.04
1589	1.705	59.1	0.1	15.10	30	82.67	-23.47
1980	1.705	48.4	0.2	30.00	30	88.63	-40.03
2374	↕	45	0.2	30.00	30	88.63	-43.43
2772	↕	46.6	0.2	30.00	30	88.63	-41.83
3162	↕	40	0.3	30.00	30	88.63	-48.33
3556	↕	42.9	0.3	30.00	30	88.63	-45.43
3950	30	39	0.3	30.00	30	88.63	-49.33

Remark:

1. All receiver readings (the measured field strength levels) are measured from loop antenna directly.
2. The emission limits shown in the above table are base on measurements employing a quasi-peak detector except for the frequency bands 9-90 KHz, 110-490 KHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
3. The tighter limit applies at the band edges.

Review:

Andy Chiu

Test Personnel.:

Nelson

Date:

Mar. 1, 2000

4-2-1 Field Strength Limits Calculation

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F (KHz)	300
0.490 - 1.705	24000/F (KHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

As the Test Methodology mentioned in Section 1-4, the measurement distance between the EUT and Loop Antenna was selected by 1 meter, the Field strength Limits of each frequency band are calculated by the following equation to convert its corresponding distance to 1 meter:

$$E_{d2} / E_{d1} = (d2/d1) \text{ square} \dots \text{equation (1)}$$

where d1 will be 1 meter, then

$$E1 = E_{d2} * (d2) / 1m \text{ square} \dots \text{equation (2)}$$

where E1 denotes the field strength limit at measurement distance 1 meter.

The measured field strength levels are read from receiver directly in dBuV/m unit. For easy to compare with field strength limits, taking command logarithm both side of equation (2), then it will be calculated as equation (3) in dBuV/m unit.

$$20 \log (E1) = 20 \log [(E_{d2}) * (d2) \text{ square}], \text{ then}$$

$$20 \log (E1) = 20 \log (E_{d2}) + 40 \log (d2) \dots \text{equation (3)}$$

4-2-2 Example for calculation

1. Frequency located in band of 0.009-0.490 MHz, the field strength limit of each frequency be calculated as

$$20 \log 2400 / F \text{ (KHz)} + 40 \log 300$$

Assume a frequency of 120 KHz be calculated, then the Field strength Limit in dBuV will be obtained

$$20 \log (2400 / 120) + 40 \log 300 = 125.1 \text{ dBuV/m}$$

2. Frequency located in band of 0.490 – 1.705 MHz, the field strength limit of each frequency be calculated as

$$20 \log 24000 / F \text{ (KHz)} + 40 \log 30$$

Assume a frequency of 600KHz becalculated, then the Field Strength Limit in dBuV will be obtained

$$20 \log (24000 / 600) + 40 \log 30 = 91.1 \text{ dBuV/m}$$

3. Frequency located in band of 30-88 MHz, the field strength limit of each frequency be calculated as

$$20 \log 30 + 40 \log 30$$

Assume a frequency of 6 MHz be calculated, then the Field Strength Limit in dBuV will be obtained

$$20 \log 30 + 40 \log 30 = 88.6 \text{ dBuV/m}$$

4. Frequency located in band of 30-88 MHz, the field strength limit of each frequency be calculated as

$$20 \log 100 + 40 \log 3$$

Assume a frequency of 60 MHz be calculated, then the Field Strength Limit in dBuV will be obtained

$$20 \log 100 + 40 \log 3 = 59.1 \text{ dBuV/m}$$

4-3. Correction Factor VS Frequency

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30.00	11.10	0.90
35.00	10.80	0.50
40.00	11.20	1.00
45.00	11.50	0.80
50.00	11.30	1.00
55.00	10.50	1.30
60.00	9.90	1.00
65.00	8.70	1.50
70.00	7.60	1.20
75.00	6.40	1.40
80.00	6.10	1.30
85.00	7.00	1.40
90.00	8.00	1.70
95.00	10.00	1.50
100.00	11.20	1.90
110.00	12.60	2.00
120.00	13.00	1.80
130.00	12.50	1.80
140.00	12.00	2.00
150.00	12.00	2.20
160.00	13.20	2.40
170.00	14.80	2.50
180.00	16.30	2.50
190.00	17.00	2.50
200.00	17.30	2.40
225.00	10.50	2.70
250.00	11.70	3.10
275.00	12.80	3.70
300.00	14.50	4.00
325.00	14.00	4.50
350.00	14.20	4.50
375.00	14.60	4.60
400.00	15.10	4.80
450.00	16.20	5.40
500.00	17.60	6.50
550.00	17.80	7.00
600.00	18.40	7.10
650.00	19.50	7.10
700.00	20.80	7.20
750.00	20.50	7.50
800.00	21.10	8.00
850.00	22.40	8.60
900.00	23.50	8.90
950.00	24.00	9.70
1000.00	24.80	10.30