# **Measurement Report**

**FCC ID:E8HKR-0309** 

This report concerns (check one) : Original Grant Class II Change

Issued Date

: Oct. 02, 2003

Project No.

: 03E0590

Equipment

: Wireless Keyboard

Model No.

: KR-0309

**Applicant** 

: Chicony Electronics Co., Ltd.

No. 25 Wu-Gong 6 Th Rd., Wu-Ku Industrial

Park, Taipei Hsien, Taiwan, R.O.C.

Tested by:

Neutron Engineering Inc. EMC Laboratory

Data of Test:

Sep. 23, 2003 ~ Sep. 30, 2003

**Testing Engineer:** 

Technical Manager:

**Authorized Signatory:** 

NEUTRON ENGINEERING INC.

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#### **Declaration**

**Neutron** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.** 

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#### **Assessment Authorities**





# Test Standard/Scope/Item Acceptance

FCC Part 15 Subpart B IEC/CISPR22 AS/NZS 3548 CNS 13438

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#### 1. General Information

# 1.1 Applicant

Name Chicony Electronics Co., Ltd.

Address No. 25 Wu-Gong 6 Th Rd., Wu-Ku Industrial Park, Taipei Hsien, Taiwan, R.O.C.

#### 1.2 Manufacturer

Name N/A Address N/A

#### 1.3 Equipment Under Tested

Name: Wireless Keyboard

Trade Name: Chicony Model No.: KR-0309

## 1.4 OEM Brand/Model (if applicable)

OEM Brand(s)/Model(s) except the basic model in sub-clause 1.3 is(are) the follows:

OEM Brand: N/A Model No.: N/A

#### 1.5 Product Descriptions (Application/Features/Specification)

The EUT is a Wireless Keyboard. A major technical descriptions of EUT is described as following:

A. Operation Frequency	CH1: 27.145 MHz and CH2: 27.195 MHz
B. Modulation Type	FSK
C. Antenna Designation	Integral
D. Number Of Channel	2
E. Channel Spacing	N/A
F. Operation Methodology	The EUT encoder generates a pulse code serially transmit (typical designation) into the modulator(or called as mixer) stage in circuit. This pulse signal mixed with the carrier at modulator(mixer) stage by way of FSK mode frequency modulation. The modulation depth is designed such as $\pm$ 5KHz in this application, that means the pulse(may be at high level state or low level state) will trigger the oscillator to generate a frequency at a specified fundamental frequency +5KHz or -5KHz, depended on the designation. For example, if the carrier frequency defined as fundamental frequency +5KHz at high level state, then the alternative carrier frequency will be fundamental frequency -5KHz at low level state.

Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual (Attachment - E.)

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## 1.6 Connecting I/O Port(s)

Please refer to the User's Manual (Attachment - E.)

1.7 Power Supplied

Power Source: Battery supplied

Power Cord: N/A

Power Rating: DC 3 V, 50mA(Max)

### 1.8 Products Covered (if applicable)

The sample tested including the following sub-system/module/accessory:

Sub-system/ Module/ Accessory Model/Type No. Int. Inst./ Ext. Cont.

Wireless Mouse MR-0350T Ext. Receiver RR-0350U Ext.

## 1.9 Model Difference (Series, Versions, if any)

Except the basic model no. (model designation of the sample tested in this test report), additional model no. covered is(are) :

N/A.

## 1.10 EUT Modifications (if applicable)

No any modification required for the EUT to comply with the standards.

#### 1.11 Electric Block Diagram

Please refer to the Attachment - A.

#### 1.12 Photos of EUT

Please refer to the Attachment – D.

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#### 2. RFI Emissions Measurement

#### 2.1Test Facility

The test facilities used to collect the test data in this report located at No.132-1, Lane 329, Sec. 2, Palain Road, Shijr City, Taipei, Taiwan.

#### 2.2 Standard Compliance

The test data contained in this report relate only to the item(s) listed below:

FCC Part15, Subpart C / RSS-210: 2001/ ANCI C63.4: 1992

The composite system (including receiver and transmitter) in compliance with Subpart B is authorized under a DOC procedure.

#### 2.3 Test Conditions and Channel

Test Channel (1)	EUT Channel	Test Frequency(MHz)
1	CH 1	27.145
2	CH2	27.195

#### Note:

(1)The measurements are performed at the highest and lowest available channels with the modulation enabled.

## 2.4 Test Methodolog

Only radiated testing was performed during the max. EMI emission evaluation. Conducted testing excepted because of the EUT is a battery operating device and no any other cable connection to PC device.

Test procedures according to the technical standards: (Antenna to EUT distance is 3 m)

	FCC Part15 (15.227), Subpart C					
Section	Test Item	Frequency Range (MHz)	Result			
15.209	Radiated Emission	Class B	30-1000	PASS		
15.227	Radiated Emission	$10000  \mu V/m  (80 dB \mu V/m)  @  3  m$	26.96-27.28	PASS		

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#### 2.5 Deviations from Standard Test Method

N/A

## 2.6 Sample(s) Tested

The representative sample tested in this reports is(are): KR-0309

Test results in this test report relate only to the sample(s) tested.

The EUT has been tested according to the following environmental condition:

Input Power	DC: 3V
Temperature	29
Relative Humidity	63 %

#### 2.7 Measurement Instruments

Valid measurement instruments used in this report refer to **Table-1** enclosed.

#### 2.8 Measurement Uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %, U=2xUc(y)

Radiated Emission Measurement ± 2.47 dB
Conducted Emission Measurement ± 2.29 dB

## 2.9 Tested System Set-Up/Configuration Details

The system was configured for testing in a typical fashion (as a user would normally use) or in-accordance with the operating configuration specified in the user's manual. A Block Diagram(please refer to the Diagram - 1) and Photos(please refer to the attachment - C) showing the set-up/configuration of system tested. In addition, **Table-2** and **Table-3** provide a detail of all equipment items and cables information used in the system tested.

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# **Table -1 Measurement Instruments List**

Item Instruments Mfr/Brand Mode/Type No. Serial No. Calibrated Date Next Cali. Da	e Note
1 LISN EMCO 3825/2 9605-2539 2003-06-10 2004-06-0	_
2 LISN Rolf Heine NNB-2/16Z 98083 2002-11-01 2003-10-3	_
3 LISN Rolf Heine NNB-2/16Z 98053 2002-11-15 2003-11-1	
4 Pulse Limiter Electro-Metrics EM-7600 112644 2002-12-09 2003-12-0	· 🗸
5 50 Terminator N/A N/A N/A 2003-05-09 2004-05-0	<b>√</b>
6 Test Cable N/A C01 N/A 2002-12-10 2003-12-0	<b>√</b>
7 Log-Bicon Antenna MESS-ELEKTRONIK VULB 9160 3058 2002-10-23 2003-10-2	. ✓
8 Log-Bicon Antenna MESS-ELEKTRONIK VULB 9160 3060 2002-10-23 2003-10-2	
9 Log-Bicon Antenna MESS-ELEKTRONIK VULB 9161 4022 2003-07-14 2004-07-1	3
10 Test Cable N/A 10M_OS01 N/A 2002-12-10 2003-12-0	) <b>✓</b>
11 Test Cable N/A OS01-1/-2 N/A 2002-12-10 2003-12-0	<b>√</b>
12 Test Cable N/A 10M_OS02 N/A 2002-12-10 2003-12-0	)
13 Test Cable N/A OS02-1/-2/-3 N/A 2002-12-10 2003-12-0	)
14         RF Switch         Anritsu         MP59B         M65982         2001-12-09         2003-12-0	<b>√</b>
15 Quasi-Peak Adapter HP 85650A 2521A00844 2003-04-21 2003-10-2	)
16         RF Pre-Selector         HP         85685A         2648A00417         2003-04-21         2003-10-2	)
17 Spectrum Analyzer         HP         85680B         2634A03025         2003-04-21         2003-10-2	)
18 Spectrum Monitor         HP         85662B         2648A13616         2003-04-21         2003-10-2	)
19 Pre-Amplifier Anritsu MH648A M09961 2002-12-09 2003-12-0	<b>3</b> ✓
20 Spectrum Analyzer   ADVAN TEST   R3261C   81720298   2003-08-13   2004-08-1	! ✓
21 Test Receiver R&S ESH3 860156/018 2002-10-22 2003-10-2	
22         Test Receiver         R&S         ESVP         860687/009         2002-12-06         2003-12-0	<b>√</b>
23 Test Receiver MEB SMV41 130 2002-12-06 2003-12-0	· 🗸
24 Test Receiver         PMM         PMM 9000         4310J01002         2002-10-06         2003-10-0	3
25 Horn Antenna EMCO 3115 9605-4803 2003-05-23 2004-05-2	?
26         Test Receiver         R&S         ESMI         843977/005         2003-01-13         2004-01-1	2
27 Pre-Amplifier R&S ESMI-Z7 1045.5020.9801 (612.278.041.00) 2003-05-19 2004-05-1	3
28 Absorbing Clamp R&S MDS-21 841077/011 2003-08-14 2004-08-1	3
29 Voltage Probe R&S ESH2-Z3 841.800/023 2003-08-26 2004-08-2	5
30 Signal Generator HP 8648A 3426A01034 2002-10-11 2004-10-0	3
31 Antenna Mast Chance Most CMTB-1.5 N/A N/A N/A	✓
32 Turn Table Chance Most CMTB-1.5 N/A N/A N/A	✓

Remark:

<sup>(1)&</sup>quot; ✓" indicates the instrument used in Test Report.
(2)" N/A" denotes No Model No. / Serial No. and No Calibration specified.

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# Diagram - 1 Block diagram showing the configuration of system tested

E-1 EUT(Tx)

	NEUTRON EMC LAB.  Report No.: NEI-FCC-P-03032  Table - 2 Equipments Used in Tested System							
Item		<b>9 - ∠ ⊑q</b> Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note		
	Wireless Keyboard		KR-0309	E8HKR-0309	N/A	EUT		

## Note:

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

**Table - 3** Information of Interface Cable

Item	Shielded Type	Ferrite Core	Length	Note
	N/A	N/A	N/A	

## Note:

- (1) Unless otherwise marked as in Remarka column, Neutron consigns the support equipment to the tested system.
- (2) For detachable type I/O cable should be specified the length in cm in <sup>®</sup> Length <sup>a</sup> column.

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	Report No.: NEI-FCC-P-03032

2.10 Max.(Worst Case) RF Emission Evaluation

- (a) Only radiated testing was performed during the max. EMI emission evaluation. Conducted testing excepted because of the EUT is a battery operating device and no any other cable connection to PC device.
- (b) The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

## 2.11 EUT Operation

The EUT exercise program used during radiated and emission measurement was designed to exercise the various system components in a manner similar to a typical use.

#### 3. Justification

#### 3.1 Limitations

#### 3.1.1 Power Line Conducted Emission

Measurement	Mains -	Terminal	Mains Te	erminals	Note
Frequency	Class A	Limits	Class B	Limits	CISPR
Range	(dBi	uV)	(dB	uV)	FCC
(MHz)	QP Mode	AV Mode	QP Mode	AV Mode	Std.
0.15 - 0.50	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 - 5.00	73.00	60.00	56.00	46.00	CISPR
5.00 - 30.0	73.00	60.00	60.00	50.00	CISPR
0.45-1.705	60.00	N/A	48.00	N/A	FCC
1.705-30.0	69.50	N/A	48.00	N/A	FCC

#### Notes:

- (1). The tighter limit applies at the band edges.
- (2). The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

## 3.1.2 Radiated Emission Limits (Frequency Range 30MHz-1000MHz)

Measurement	Quasi-Pe	eak Mode	Quasi-Pe	eak Mode	Note
Frequency	Class A	Limits	Class E	3 Limits	CISPR
Range	(dBu	V/m)	(dBu	V/m)	FCC
(MHz)	10m	30m	10m	3m	Std.
30.00 -230.00	40.00	30.00	30.00	40.00	CISPR
230.0 -1000.0	47.00	37.00	37.00	47.00	CISPR
30.00 - 88.00	39.00	N/A	30.00	40.00	FCC
88.00 - 216.0	43.50	N/A	33.50	43.50	FCC
216.0 -960.0	46.00	N/A	36.00	46.00	FCC
above 960.0	49.50	N/A	46.00	54.00	FCC

#### Notes:

- (1). The tighter limit applies at the band edges.
- (2). Emission level (dBuV/m)=20log Emission level (uV/m).
- (3). A measuring distance of 10m is a primary used. However, either 3m or 10m (instead of 10m) distance my be allowed. If the distance is 3m, add 10dB to the QP-limit above. If the distance is 10m, subtract 10dB from the QP-limit above.

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#### 3.2 Measurement Justification

#### 3.2.1 Conducted Emission

The EUT is a placed on as table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-1992. Conducted emissions from the EUT measured in the **frequency range between 0.15 MHz and 30MHz** were made with a **Spectrum Analyzer** using **CISPR Quasi-Peak detector mode**.

The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and these signals are then Quasi Peak detector mode and/or Average detector mode re-measured.

Data of **Table - 4**. lists the significant emission frequencies, measured levels, limits and safe margins. All readings are Peak Mode measured unless otherwise stated as QP or AV in column of "Remark".

If the Peak Mode measured value lower than both QP Mode and AV Mode Limit, EUT shall be deemed to compliance with both QP & AV Limits and then no additional QP Mode or AV Mode measurement performed.

If additional QP or AV Mode measurement needed, and if the QP Mode measured value compliance with the QP Mode Limit and lower than AV Mode Limit, the EUT shall be deemed to meet both QP & AV Limits and then only QP Mode was measured, but AV Mode was not performed.

#### 3.2.2 Radiated Emission

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.

The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak, Peak or Average detector mode re-measured.

Data of **Table – 5** lists the significant emission frequencies, measured levels, limits and safe margins. All readings are Peak Mode measured unless otherwise stated as QP or AV in column of "Remark".

If the Peak Mode measured value compliance with and lower than Quasi Peak or Average Mode Limit, the EUT shall be deemed to meet QP/AV Limits and then no additional QP/AV Mode measurement performed.

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## 3.2.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as FS = RA + AF + CL - AG

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor (1)

CL = Cable Attenuation Factor(Cable Loss) (1)

AG = Amplifier Gain (1)

## Remark:

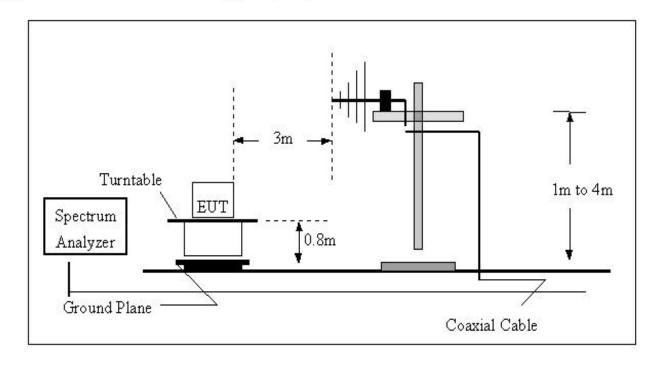
(1) The Correction Factor = AF + CL - AG, as shown in the data tables' Correction Factor column.

#### 3.3 Measurement Data

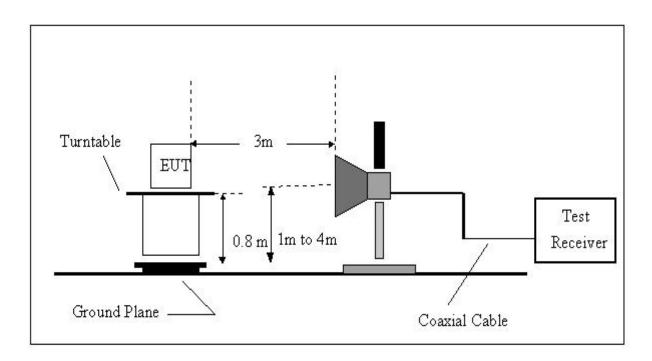
Table - 4. Conducted Emission Data (015-30MHz) - Not Applicable

Table - 5. Radiated Emission Data (30-1000MHz)

# (A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



# (B) Radiated Emission Test Set-UP Frequency Over 1 GHz



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# **Table 5 Radiated Emission Data (30-1000MHz)**

Special Notes: (EUT Operation Mode or Test Configuration Mode, if applicable)

CH1

Freq.	Ant.Pol.	DetectorMod	e Reading	Ant./CL/	Actual FS	Limit3m	Safe Margin	Note
(MHz)	<u>H/V</u>	(PK/AV)	(dBuV)	Amp. CF(d	<u>B) (dBuV/m)</u>	(dBuV/m)	(dB)	
27.145	V	Peak	68.70	-15.49	53.21	80.00	-26.79	F
26.960	V	Peak	32.60	-15.53	17.07	69.50	-52.43	Е
27.280	V	Peak	20.60	-15.46	5.14	69.50	-64.36	Е
54.290	V	Peak	28.90	-13.05	15.85	40.00	-24.15	Н
81.435	V	Peak	31.10	-15.93	15.17	40.00	-24.83	Н
108.580	V	Peak	34.90	-13.57	21.33	43.50	-22.17	Н
135.725	V	Peak	33.10	-10.68	22.42	43.50	-21.08	Н
162.870	V	Peak	32.40	-10.18	22.22	43.50	-21.28	Н
27.145	Н	Peak	71.10	-15.49	55.61	80.00	-24.39	F
26.960	Н	Peak	35.70	-15.53	20.17	69.50	-49.33	Е
27.280	Н	Peak	37.80	-15.46	22.34	69.50	-47.16	Е
54.290	Н	Peak	36.20	-13.05	23.15	40.00	-16.85	Н
81.435	Н	Peak	38.60	-15.93	22.67	40.00	-17.33	Н
108.580	Н	Peak	39.30	-13.57	25.73	43.50	-17.77	Н
135.725	Н	Peak	37.80	-10.68	27.12	43.50	-16.38	Н
162.870	Н	Peak	32.70	-10.18	22.52	43.50	-20.98	Н

#### Remark:

- (1) Spectrum Setting: 30MHz 1000MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms
- (2) All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
- (3) Measuring frequency range from 25MHz to 1000MHz or the 10th harmonic of highest fundamental frequency, "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (4) Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode or QP detector mode of the emission .
- (5) Data of measurement within this frequency range shown " " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

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# **Table 5 Radiated Emission Data (30-1000MHz)**

Special Notes: (EUT Operation Mode or Test Configuration Mode, if applicable)

CH<sub>2</sub>

Freq.	Ant.Pol.	DetectorMod	e Reading	Ant./CL/	Actual FS	Limit3m	Safe Margin	Note
(MHz)	H/V	(PK/AV)	(dBuV)	Amp. CF(d	B) (dBuV/m)	(dBuV/m)	(dB)	
27.195	V	Peak	67.90	-15.48	52.42	80.00	-27.58	F
26.960	V	Peak	22.70	-15.53	7.17	69.50	-62.33	Е
27.280	V	Peak	39.60	-15.46	24.14	69.50	-45.36	Е
54.390	V	Peak	31.90	-13.05	18.85	40.00	-21.15	Н
81.585	V	Peak	32.60	-15.91	16.69	40.00	-23.31	Н
108.780	V	Peak	33.90	-13.56	20.34	43.50	-23.16	Н
135.975	V	Peak	31.00	-10.65	20.35	43.50	-23.15	Н
163.170	V	Peak	31.40	-10.21	21.19	43.50	-22.31	Н
27.195	Н	Peak	73.30	-15.48	57.82	80.00	-22.18	F
26.960	Н	Peak	33.80	-15.53	18.27	69.50	-51.23	Е
27.280	Н	Peak	44.60	-15.46	29.14	69.50	-40.36	Ε
54.390	Н	Peak	37.30	-13.05	24.25	40.00	-15.75	Н
81.585	Н	Peak	37.00	-15.91	21.09	40.00	-18.91	Н
108.780	Н	Peak	37.10	-13.56	23.54	43.50	-19.96	Н
135.975	Н	Peak	36.20	-10.65	25.55	43.50	-17.95	Н
163.170	Н	Peak	34.00	-10.21	23.79	43.50	-19.71	Н

#### Remark:

- (1) Spectrum Setting: 30MHz 1000MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms. 1GHz- 25GHz, RBW= 1MHz, VBW= 1MHz, Sweep time = 200 ms
- (2) All readings are Peak unless otherwise stated QP in column of PNote 1. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
- (3) Measuring frequency range from 25MHz to 1000MHz or the 10th harmonic of highest fundamental frequency, "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (4) Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Peak detector mode or QP detector mode of the emission .
- (5) Data of measurement within this frequency range shown " " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

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# **Attachment**

# **Table Contents**

- A. Electric Block Diagram
- B. EUT Modification Description
- C. EUT Photos
- D. EUT Test Photos
- E. User's Manual
- F. Product Labeling
- G. Bandwidth Requirement (Plot)
- H. Laboratory Accreditation Certificate

NEUTRON EMC LAB.		Report No. : NEI-FCC-P-03032
	Attachment - A.	
Fle	ectric Block Diagrar	m
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NEUTRON EMC LAB.		Report No. : NEI-FCC-P-03032
ı	Attachment - B.	
EUT Mo	dification Descripti	on

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		Attachme	nt - C.		
		EUT Test F	Photos		

NEUTRON EMC LAB.	

# Attachment - D

# **EUT Photos**

- 1. Photo # 1 Front View/ Rear View
- 2. Photo # 2~5 Unit Partially Disassembled

NEUTRON EMC LAB.		Report No. : NEI-FCC-P-03032
A	Attachment – E	
	User's Manual	

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	Attachment - F	
F	Product Labeling	g

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	Attachr	nent - G.	
В	andwidth	Requiremen	t

NEUTRON E	MC LAB.	
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# Attachment - H.

**Laboratory Accreditation Certificate**