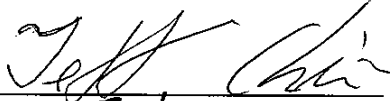



***EXHIBIT B***

***Test Report***

Report No.	G2115651
Specifications	FCC Part 15.231(c), Certification.
Test Method	ANSI C63.4 1992
Applicant address	6F, No.2, Lane 348, Chung Shan RD., Sec. 2, Chung Ho City, Taipei Hsien, Taiwan, R.O.C.
Applicant	Powertech Industrial Co., Ltd
Kind of Equipment	Intentional Periodic Radiator
Items tested	Transmitter of Wireless Remote Outlet
Model No.	PTTX01 (Sample # G21651)
Results	<b>Compliance</b> (As detailed within this report)
Sample received date	08/10/99 (month / day / year)
Prepared by	 project engineer
Authorized by	 General Manager (Frank Tsai)
Issue date	Aug. 10, 1999 (month / day / year)
<b>Modifications</b>	<b>None</b>
Tested by	Training Research Co., Ltd.
Office at	2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan
Chamber at	2, Lane 194, Huan-Ho Street, Hsichih, Taipei Hsien 221, Taiwan

**Conditions of issue:**

- (1) *This test report shall not be reproduced except in full, without written approval of TRC. And the test result contained within this report only relate to the sample submitted for testing.*
- (2) *This report must not be used by the client to claim product endorsement by NVLAP or any agency of U.S. Government.*

★ **FCC ID: NHSPTTX01**

Report No.: G2115651, Transmitter of Wireless Remote Outlet, FCC Part 15.231(C), Certification

Test date: 08/13/99, Training Research Co., Ltd., TEL: 886-2-26935155, Fax: 886-2-26934440

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## GENERAL

### 1.1 Introduction

### 1.2

The following measurement report is submitted on behalf of applicant in support of an International Periodic Radiator certification with Part 2 Subpart J and Part 15 Subpart A and C of the Commission's Rules and Regulations.

### 1.3 Description of EUT

**EUT** : Transmitter of Wireless Remote Outlet  
**Model** : PTTX01  
**FCC ID** : NHSPTTX01  
**Frequency Range** : Operated in 314.67 MHz  
**Power Type** : Powered by Battery  
**Applicant** : Powertech Industrial Co., Ltd.  
6F, No. 2, Lane 348, Chung Shan RD., Sec. 2,  
Chung Ho City, Taipei Hsien, Taiwan, R.O.C.

The fundamental frequency of transmitter emitted is due to a press on button of the EUT. **The emitting time of fundamental frequency is less than 5 seconds** pursuant to FCC Part 15.231(a). There are security codes for avoiding the possibility of duplicating codes in adjacent systems. The coding must be matching with the companion receiver.

While testing the EUT was adjusted at a position which transmit the maximum emission.

### 1.4 Description of Support Equipment

The EUT itself forms a system. No support equipment is required for its normal operation.

### 1.5 Test Procedure

All measurements contained in this report were performed according to the techniques described in measurement procedure of ANSI C63.4 1992 section 13

## **1.6 Location of the Test Site**

The radiated emission measurement required by the rule were performed on the three-meter, open-field test site maintained by *Training Research Co., Ltd.*, No. 2, Lane 194, Huan Ho Street, Hsichih City, Taipei, Taiwan, R.O.C. Complete description data have been placed on file with the Commission. The conducted power line emissions tests were performed in a shielded enclosure also located at the above facility. *Training Research Co., Ltd. Listed is by the FCC as a facility available to do measurement work for other on a contract basis.*

## **1.7 General Test Condition**

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests was chosen as that which produced highest emission levels. However, only those conditions that the EUT was considered likely encounter in normal use were investigated.

## ***Transmitter Duty Cycle Measurements***

### **2.1 Test Condition and Setup**

The duty cycle measurements were performed in a shielded enclosure. The EUT was placed on a wooded table which is 0.8 meters height and a bi-log periodic antenna was used distance about 2 meters for receiving. While testing EUT was set to transmit continuously. Various key configurations were also investigated to find the maximum duty cycle.

The resolution bandwidth and video bandwidth of the spectrum analyzer was all set to 1MHz to encompass all significant spectral components during the test. The analyzer operated in linear scale and zero span mode after tuning to the transmitter carrier frequency. A digital oscilloscope was connected to the aux video output of the spectrum analyzer for measuring pules width. The pulse width was determined by the difference between the two half voltage points on a pulse.

The duty cycle was determined by the following equation:

$$\text{Duty Cycle (\%)} = \frac{\text{Total on interval in a complete pulse train}}{\text{Length of a complete pulse train}} \times 100\%$$

To calculate the actual field intensity, the duty cycle correction factor in decibel is needed for later use and be obtained from following conversion:

$$\text{Duty Cycle Correction Factor (dB)} = 20 \times \text{Log}_{10} \text{ Duty Cycle}$$

### **2.2 List of Test Instruments**

<u>Manufacturer</u>	<u>Device</u>	<u>Model</u>	<u>Input impedance</u>
Hewlett Packard	9KHz - 1.8GHz Spectrum Analyzer	HP8591EM	50.00
Hewlett Packard	400MHz Digitizing Oscilloscope	HP54502A	1M
EMCO	20-1000MHz Log Periodic Antenna	3142	50.00

### 2.3 Test Instruments Configuration

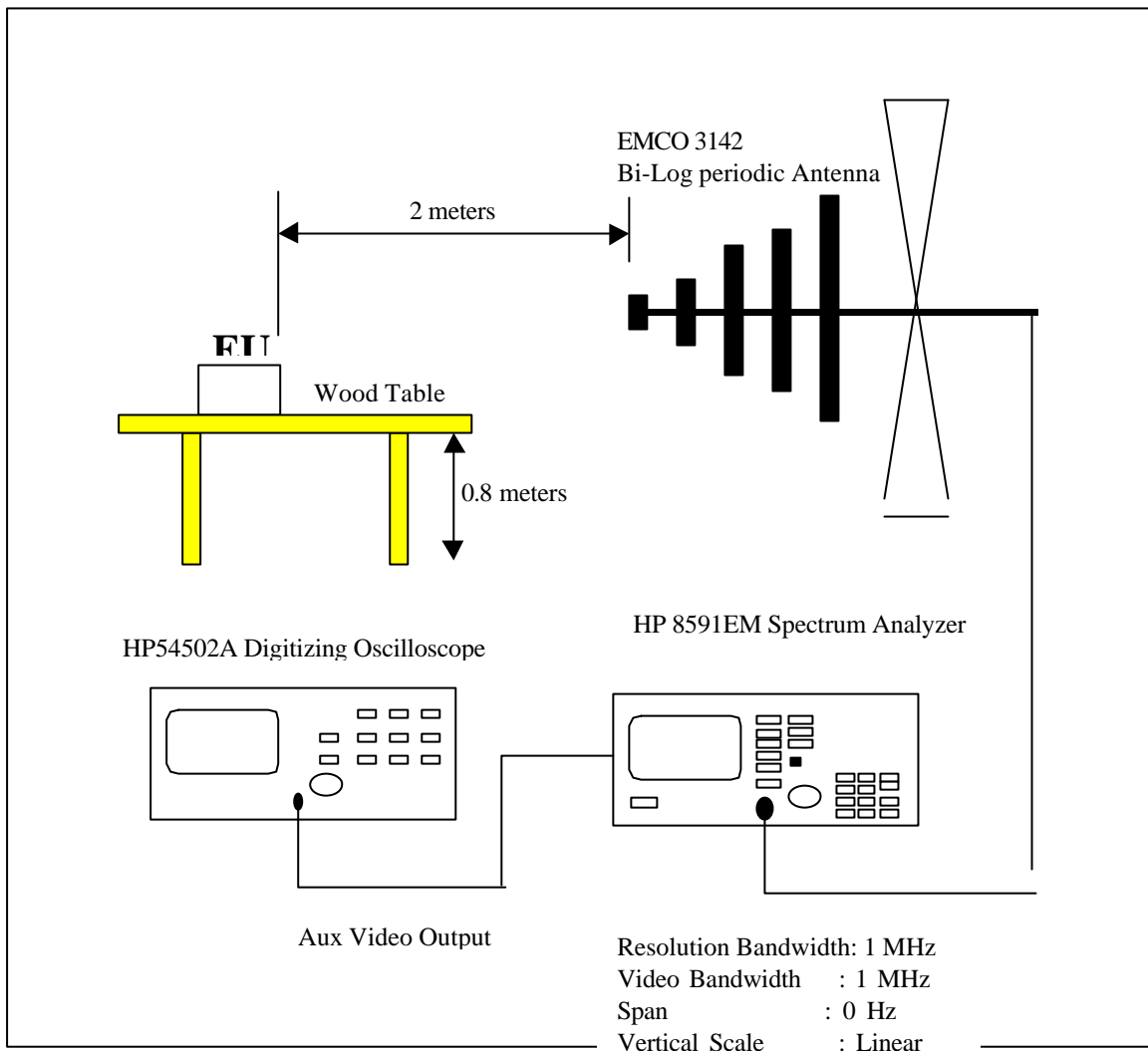


Fig 1. Test Configuration of Duty Cycle Measurement

### 2.4 Test Result

Following is the test result which produce maximum duty cycle :

Total on interval in a complete pulse train = 31.000 ms

Length of a complete pulse train = 41.500 ms

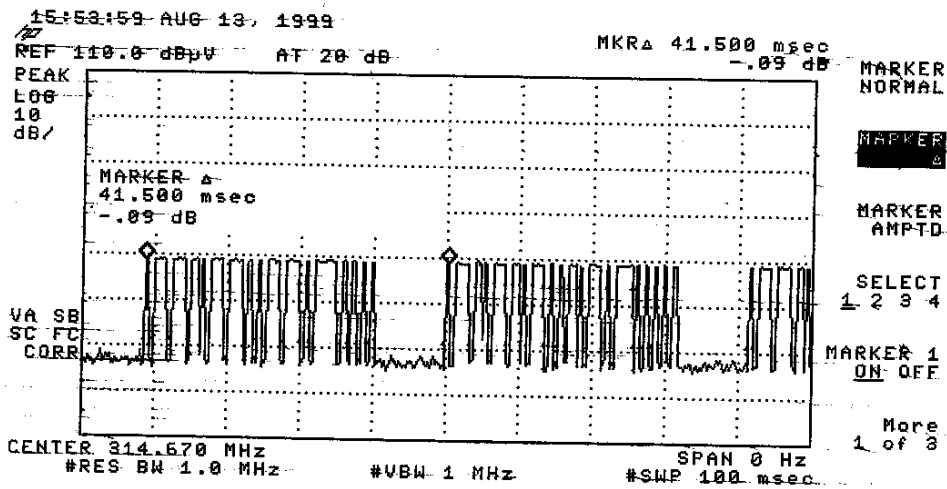
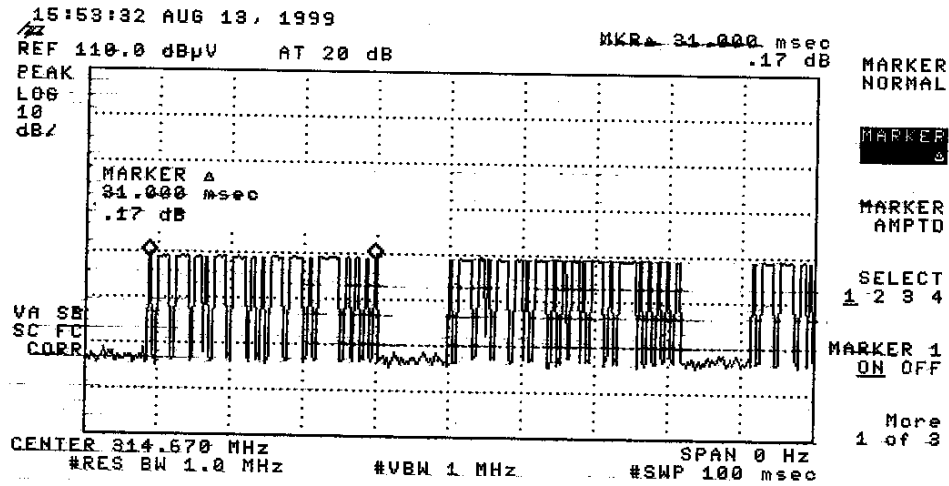
Duty cycle (%) =  $31.000 \text{ ms} / 41.5000 \text{ ms} * 100\% = 0.746987951$

Duty Cycle Correction Factor (dB) =  $20 * \text{Log } 0.746987951 = -2.53$

A plot is attached on the following page.



Fig 1. Oscilloscope Plot of the Duty Cycle Test



***Transmitter Bandwidth Measurements, FCC Part 15, 15.231(c)***

**3.1 Test Condition & Setup**

The test setup used to transmitter bandwidth measurement was the same with duty cycle test, except there is no need for digital oscilloscope in the bandwidth test. For detailed description, please reference to section 2.1, 2.2, 2.3 on page 4 and 5 of this report.

The resolution bandwidth of the spectrum analyzer was set to 100KHz which is greater 5 percent of the maximum permitted bandwidth that required by the ANSI C63.4 section13. Bandwidth is determined at the point 20dB down from the modulator carrier. The maximum permitted bandwidth specified by the rule was 0.25% of the center frequency of the EUT, e.g.  $315.016\text{MHz} * 0.25\% = 787.54\text{KHz}$ . The detector function was set to peak and hold mode to clearly observe the components.

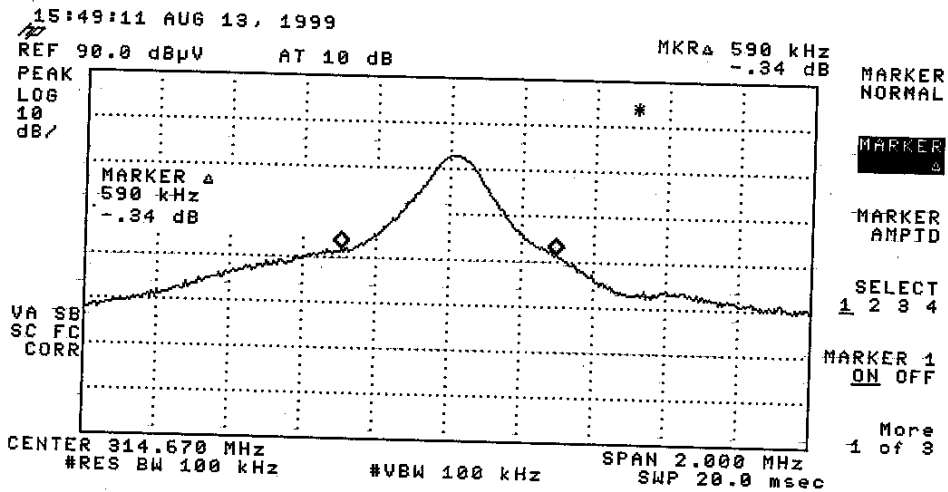
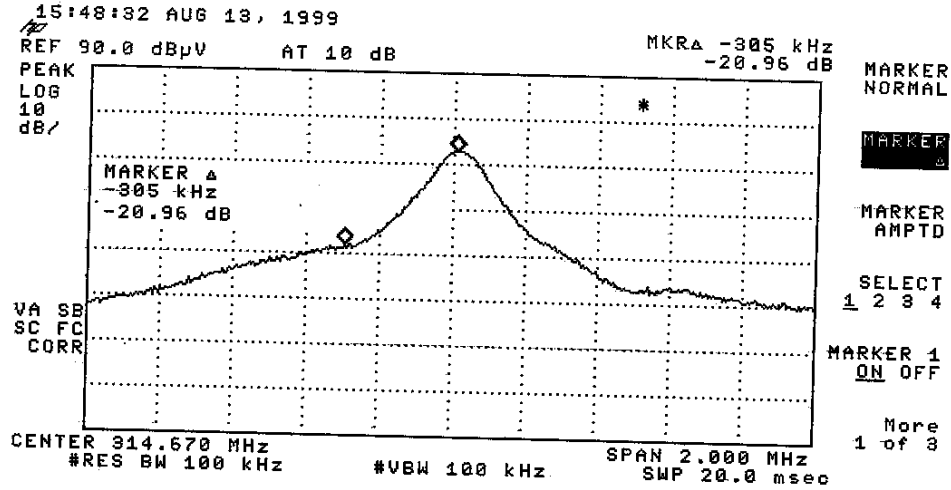
**3.2 Test Result**

Measured Transmitter Bandwidth : 590.00 KHz

Permitted Maximum Bandwidth : 786.675 KHz

A plot attached on the following page.

Fig 2. Spectrum Plot of the Transmitter Bandwidth Measurement



#### ***IV. Conducted Emissions Measurements***

The EUT operates solely by the battery. According to the rule of section 15.207(c). The EUT exempt to the power line conducted test.

## **V. Radiated Emissions Measurements**

### **5.1 General Configuration**

Prior to open-field testing, the EUT was placed in a shielded enclosure and scanned at a close distance to determine its emission characteristics. The physical arrangement of the EUT was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude, directivity, and frequency. The exact system configuration that produced the highest emissions was noted so it could be reproduced later during the final tests. This was done to ensure that the final measurements would demonstrate the worst-case interference potential of the EUT.

### **5.2 Test Condition and Setup**

Final radiation measurements were made on a three-meter, anechoic chamber. The EUT was placed on a nonconductive turntable that is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 30 MHz to 20 GHz order to check the whole spectrum that could be generated from the EUT. During the test, EUT was set to transmit continuously and the switch was positioned to yield the maximum duty cycle that had measured before radiated emissions test. The test battery was a totally brand-new one.

A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations.

**Note: Setting the EUT to transmit continuously was just for the testing**

The field strength below 1 GHz was measured by EMCO Bi-Log Periodic Antenna (model 3142) at 3 meter, and the EMCO Double Ridged Guide Antenna (model 3115) was used in frequencies 1-20 GHz at a distance of 1 meter. All test results were extrapolated equivalent signal at 3 meters utilizing an inverse linear distance extrapolated factor (20dB/decade).

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post-detector video filters were used in the test. The spectrum analyzer's 6dB bandwidth was set to 3 M and the spectrum was operated in the peak detection mode, for frequencies both below and up 1 GHz. The peak levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBµV) into field intensity in microvolts pre meter (µV/m).

- (1) The actual field intensity in decibels referenced to 1 microvolt per meter (dBµV/m) is determined by algebraically adding the measured reading in dBµV, the correction factor (dB), duty cycle correction factor (dB), and distance extrapolation factor (dB) at the appropriate frequency:

**30 MHz ~ 1GHz:**

Correction factor = Antenna factor + (Cable Loss - Amplitude gain)

Corrected Amplitude = Reading Amplitude + Correction Factors

(For example: 30MHz correction factor = 15.5 + (-15.26) = 0.24 dB/m)

**Above 1GHz**

- 1. Correction Factors = Antenna Factor + Cable Loss – Distance Extrapolation Factor (9.54dB) - Amplifier Gain

- 2. Peak Amplitude + Correction Factor + Duty Cycle Correction Factor = Corrected

- (2) The field intensity in microvolts per meter can then be determined by the following equation:

$$FI(\mu V/ m) = 10^{FI (dB\mu V/ m) / 20}$$

The FCC specified emission limits were calculated according the EUT operating frequency and obtained by following linear interpolation equations:

**(1) For fundamental frequency:**

$$\text{Emission Limit}(\mu V/m) = [f_{EUT}(\text{MHz}) - 260(\text{MHz})] \times \frac{12500(\mu V/m) - 3750(\mu V/m)}{470(\text{MHz}) - 260(\text{MHz})} + 3750(\mu V/m)$$

**(2) For spurious frequencies:**

$$\text{Emission Limit} (\mu V/m) = [f_{EUT}(\text{MHz}) - 260(\text{MHz})] \times \frac{1250(\mu V/m) - 375(\mu V/m)}{470(\text{MHz}) - 260(\text{MHz})} + 375(\mu V/m)$$

**5.3 List of Test Instruments**

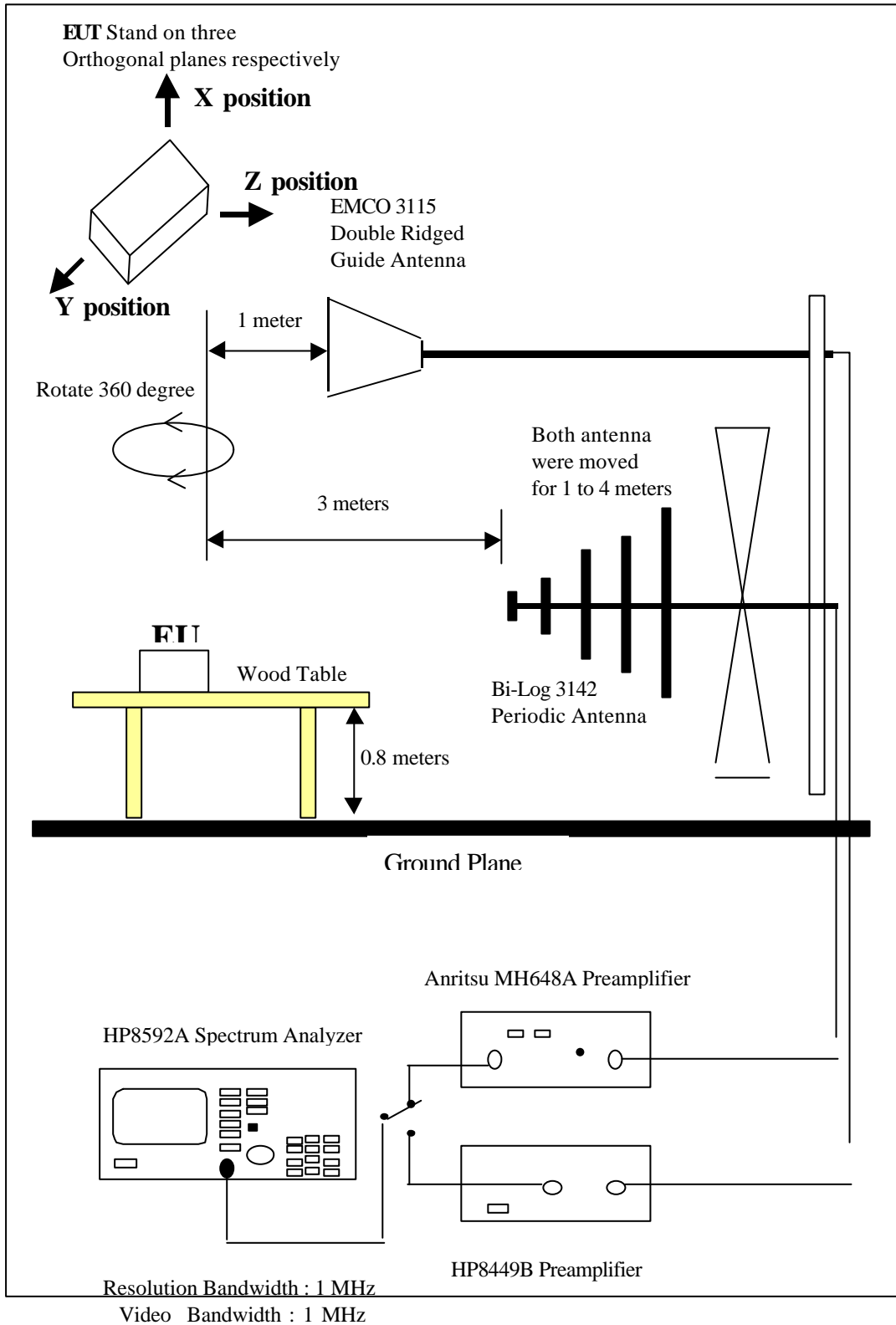
Manufacturer	Device	Model	Input Impedance
Hewlett Packard	9KHz-2.9 GHz Spectrum Analyze	HP8594EM	50.00
Hewlett Packard	50kHz-22GHz Spectrum Analyzer	HP8592A	50.00
Hewlett Packard	1GHz-26.5GHz Preamplifier	HP8449B	50.00
Anritsu	0.1-1200MHz Preamplifier	MH648A	50.00
EMCO	20-2000MHz Biconical Antenna	3142	50.00
EMCO	1G-18GMHz Double Ridge Antenna	3115	50.00
TRC	Open Field Test Site	TRC-OFTS1	N/A
TRC	Notch Filter	N/A	50.00
TRC	Horn Antenna with Amplifier	TRC1	50.00

#### 5.4 Test Instruments Configuration

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*Report No.: G2115651, Transmitter of Wireless Remote Outlet, FCC Part 15.231(C), Certification*

*Test date: 08/13/99, Training Research Co., Ltd., TEL: 886-2-26935155, Fax: 886-2-26934440*





**Radiated Test Placement: (Photographs)**



**5.5 Test Result of Radiated Emissions**

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation, etc. are recorded on the following.

Table 1 Open Field Radiated Emissions For 30MHz - 1GHz [Horizontal]  
(Orthogonal: X-position)

Radiated Emission				Correction Factors	Corrected Amplitude (dBμV/m)	FCC Class B ( 3 M )	
Frequency (MHz)	Amplitude (dBμV/m)	Ant.H. (cm)	Table ( ° )	(dB)		Limit (dBμV/m)	Margin (dB)
314.820	90.61	1.00	314	-17.30	73.31	75.60	-2.29
629.648	65.92	3.00	281	-23.40	42.52	55.60	-13.08
***							

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude +Correction Factors = Corrected

Table 2. Open Field Radiated Emissions for 1 GHz -18 GHz [Horizontal]

Radiated Emission				Correction Factors	Duty Cycle	Corrected Amplitude (dBμV/m)	FCC Class B ( 3 M )	
Frequency (GHz)	Amplitude (dBμV/m)	Ant.H. (cm)	Table ( ° )	( dB )	( dB )		Limit (dBμV/m)	Margin (dB)
***	***	***	***	***	***	***	***	***

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor + Duty Cycle = Corrected
3. **The emissions that above 1GHz were all in the ambient.**

**Table 3 Open Field Radiated Emissions For 30MHz – 1GHz [Vertical]**

(Orthogonal: Y-position)

Radiated Emission				Correction Factors (dB)	Corrected Amplitude (dBµV/m)	FCC Class B (3 M)	
Frequency (MHz)	Amplitude (dBµV/m)	Ant.H. (cm)	Table (°)			Limit (dBµV/m)	Margin (dB)
314.820	87.03	1.00	288	-17.41	69.62	75.60	-5.98
630.150	63.64	1.00	94	-23.64	40.00	55.60	-20.73
***							

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factors = Corrected

**Table 4. Open Field Radiated Emissions For 1 GHz -18 GHz [Vertical]**

Radiated Emission				Correction Factors (dB)	Duty Cycle (dB)	Corrected Amplitude (dBµV/m)	FCC Class B (3 M)	
Frequency (GHz)	Amplitude (dBµV/m)	Ant.H. (cm)	Table (°)				Limit (dBµV/m)	Margin (dB)
***	***	***	***	***	***	***	***	***

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor + Duty Cycle = Corrected

**The emissions that above 1GHz were all in the ambien**

