

Measurement of Maximum Permissible Exposure

1. Foreword

In adopt with the Human Exposure IEEE C95.1, and according to the FCC 1.1310. The *Maximum Permissible Exposure (MPE)* is obligated to measure in order to prove the safety of radiation harmfulness to the human body.

The *Gain* of the antenna used is measured in an *Anechoic chamber*. The *maximum total power to the antenna* is to be recorded. By adopting the ***Friis Transmission Formula*** and the *power gain of the antenna*, we can find the distance right away from the product, where the limit of the MPE is.

2. Description of EUT

FCC ID	:	NHPWLG1600
Product Name	:	802.11g 54Mbps Wireless LAN Compact Flash Adapter
Model Name	:	WLG-1600
Frequency Range	:	2.412GHz ~ 2.462GHz
Channel Spacing	:	5MHz
Support Channel	:	11 Channels
Modulation Skill	:	DBPSK, DQPSK, CCK, OFDM

3. Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	100	6
3.0-30	1842/f	4.89/f	900/f ²	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	100	30
1.34-30	824/f	2.19/f	180/f ²	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

[The EUT is tested in transmit and receive modes and in the first, middle and the last channel separately.

The following shows only our observation have the greatest emissions.]

According to OET BULLETIN 56 Fourth Edition/August 1999, Equation for Predicting RF Fields:

$$\text{Friis Transmission Formula: } S = \frac{PG}{4\pi R^2} = \frac{190.11 \times 1.51}{4\pi (20)^2} = 0.057 \text{ mW} / \text{cm}^2$$

$$\text{Estimated safe separation: } R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{190.11 \times 1.51}{4\pi}} = 4.780 \text{ cm}$$

Note: "The safe estimated separation that the user must maintain from the antenna is at least 6.5cm"

Where: S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

The Numeric gain G of antenna with a gain specified in dB is determined by:

$$G = \text{Log}^{-1} (\text{dB antenna gain} / 10)$$

$$G = \text{Log}^{-1} (1.80 / 10) = 1.51$$

Appendix

Antenna Specification

豪岑電子金屬股份有限公司

HOW TSEN INTL. ELECTRONICS METAL CO., LTD.

P.T HOWSANINDO INDUSTRY(INDONESIA)

桃園縣 327 新屋鄉中山東路 2 段 130 巷 12 號

TAIWAN : NO.12 LANE 130. SEC, 2, CHUNG-SAN EAST RD., SHIN WU HSIANG TAOYUAN HSIEN, TAIWAN, R.O.C

TEL : 886-3-4777517 hunting FAX : 886-3-4777520

INDONESIA : JL PANGKALAN 1-B BANTAR GEBANG, BEKASI 17310 INDONESIA

TEL : 62-21-8250470 hunting FAX :62-21-8250473

SPECIFICATION FOR APPROVAL

PARTS NAME : Wireless LAN Antenna

TYPE NO : S-099

CUSTOMER P/N :

DATE : September.02,2005

CUSTOMER APPROVAL & COMMENT

FULL NAME	POSITION	SIGNATURE	COMPANY STAMP	COMMENT
		DATE :		
RECOGNIZED		ENGINEERING		QC CHECK

HOW TSEN INTL. ELECTRONICS METAL CO., LTD.

ANTENNA SPECIFICATIONS FOR APPROVAL

1 GENERAL DESCRIPTION

1.1 Type No. : **S-099**

1.2 Customer P/N :

2 DESCRIPTION & APPLICATION

This antenna assembly is designed for use in portable.

Communications equipment over a temperature range.

Of -20 °C to +70 °C in an indoor / outdoor environment.

3 ELECTRICAL CHARACTERISTICS

3.1 Frequency Range : 2.4 ~ 2.5 Ghz

3.2 Marker : 2.4 / 2.43 / 2.45 / 2.4835 / 2.5 GHz

3.3 Connector : SMA (Male)

3.4 V.S.W.R : 2.0:1.0 or less

3.5 Return Loss : -10 dB Maximum

3.6 Impedance : 50 Ω Nominal

3.7 Gain : 1.8 dBi (Typ)

3.8 Polarization : Vertical

3.9 Radiation Pattern : Near omni-directional in the horizontal plane

3.10 Admitted Power : 1W

3.11 Electrical Wave : $1/2\lambda$ Dipole

4 ENVIRONMENTAL CHARACTERISTICS

4.1 High temperature/Humidity Operating test

4.1.1 Temperature : +60 °C ± 2 °C

4.1.2 Humidity : 90 ~ 95% RH

4.1.3 Time : 24hrs

4.2 Low temperature/Humidity Operating test

4.2.1 Temperature : -20 °C ± 2 °C

4.2.2 Humidity : 0% RH

4.2.3 Time : 24hrs

4.3 High temperature/Humidity Storage

4.3.1 Temperature : +70 ± 2 °C

4.3.2 Humidity : 90 ~ 95% RH

4.3.3 Time : 88hrs

4.4 Low temperature/Humidity Storage

4.4.1 Temperature : $-20 \pm 2^{\circ}\text{C}$

4.4.2 Humidity : 0% RH

4.4.3 Time : 28hrs

4.5 Temperature Cycle Operating Test

4.5.1 temperature : $-20^{\circ}\text{C} \sim +70^{\circ}\text{C}$

4.5.2 Duration : ● 88 Hours

● 45mia/dwelling@ -40°C ,

● 10°C per min./transition from -20°C to 70°C

● 45mia/dwelling@ 70°C ,

4.6 Temperature Shock Test

4.6.1 Temperature : $-20 \pm^{\circ}\text{C} \sim +70^{\circ}\text{C}$

4.6.2 Time : 30 minutia/dwelling , 5 minutia/dwelling , 24 cycles

5 QUALIFICATION TESTING

5.1 Qualification testing, all product shall be able to withstand the following testing.

5.2 Physical dimensions identified within this specification.

6 INSPECTION STANDARD

6.1 Dimension to use the special inspection level of S-4 , AQL 1.0 .

6.2 Appearance to use MIL-STD-105DII AQL1.0 .

6.3 Mechanical Capability : Per lot Sampling, $n=5$, Ac 0 , Re 1 .

6.4 Environmental test : Per lot Sampling, $n=3$, Ac 0, Re 1 .

7 PACKING STYLE

If customer has no specific request by the customer, all according to our standard Packing specification.

8 OTHERS

Any changes in this specification should be agreed by both parties.

Wireless LAN Antenna

For 2.4~2.5GHz

Type No. : S-099

Electrical Specification

Frequency range	2.4~ 2.5 GHz
Marker	2.4/1.43/1.45/2.4835/2.5
Connector	SMA(Male)
V.S.W.R	2.0:1.0 or less
Return Loss	-10 dB Maximum
Impedance	50 Ω Nominal
Gain	1.8 dBi (Typ)
Polarization	Vertical
Radiation Pattern	Near omni-directional in the horizontal plane
Admitted Power	1W
Electrical Wave	1/2 λ Dipole



HOW TSEN intl. Electronics Metal Co., Ltd. <http://www.howtsen.com.tw>

HOW SANE industries Co., Ltd

E-mail:howtsen@ms9.hinet.net

HOW TSEN INTL. ELECTRONICS METAL CO.,LTD.

TEST REPORT

1.MODEL: *S-099*

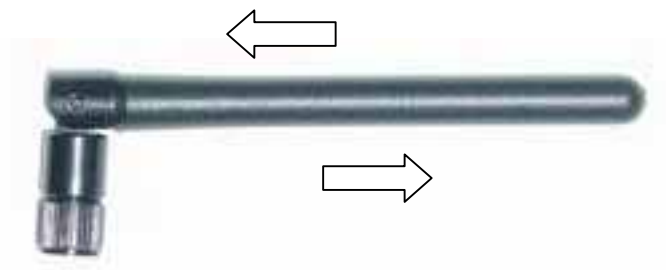
2.QUANTITY: *5 Pcs*

3.DATE OF TESTING: *September.02,2005*

4.TESTING ITEM: *PULL TEST*

5.TESTING EQUIPMENT: *B-016 (PUSH-PULL SCALE FB30K)*

6.TESTING CONDITIONS: *Antenna must withstand a 3 kgf tensile*
Load applied to tube for 30 seconds.
No part of the antenna may be pulled out of
The assembly or from the housing.



7.TESTING RESULT:

<i>Sample</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>OK or NG</i>	<i>OK</i>	<i>OK</i>	<i>OK</i>	<i>OK</i>	<i>OK</i>

DEPT.MANAGER:

TESTER:

HOW TSEN INTL. ELECTRONICS METAL CO.,LTD.

TEST REPORT

1.MODEL: *S-099*

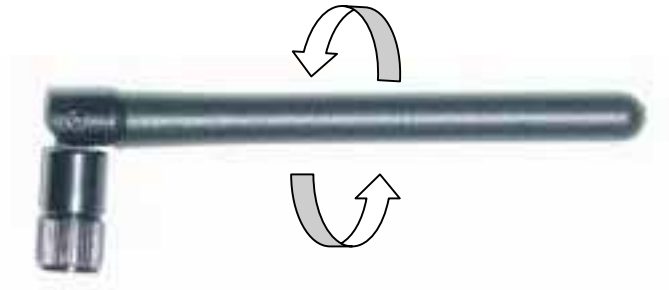
2.QUANTITY: *5 Pcs*

3.DATE OF TESTING: *September:02,2005*

4.TESTING ITEM: *TORQUE TEST*

5.TESTING EQUIPMENT: *B-001 (MECHANICAL TORQUE METER 2-TM30)*

6.TESTING CONDITIONS: *3 KGF-CM NO DAMAGE HAPPENED.*



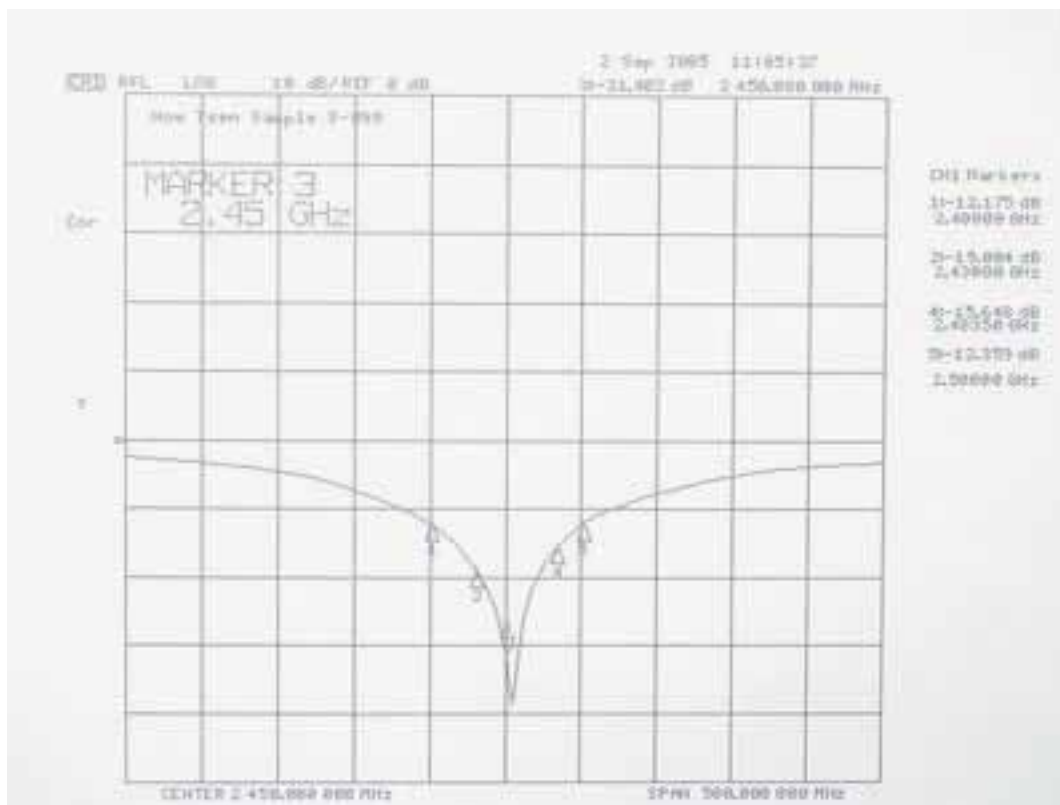
7.TESTING RESULT:

<i>Sample</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>OK or NG</i>	<i>OK</i>	<i>OK</i>	<i>OK</i>	<i>OK</i>	<i>OK</i>

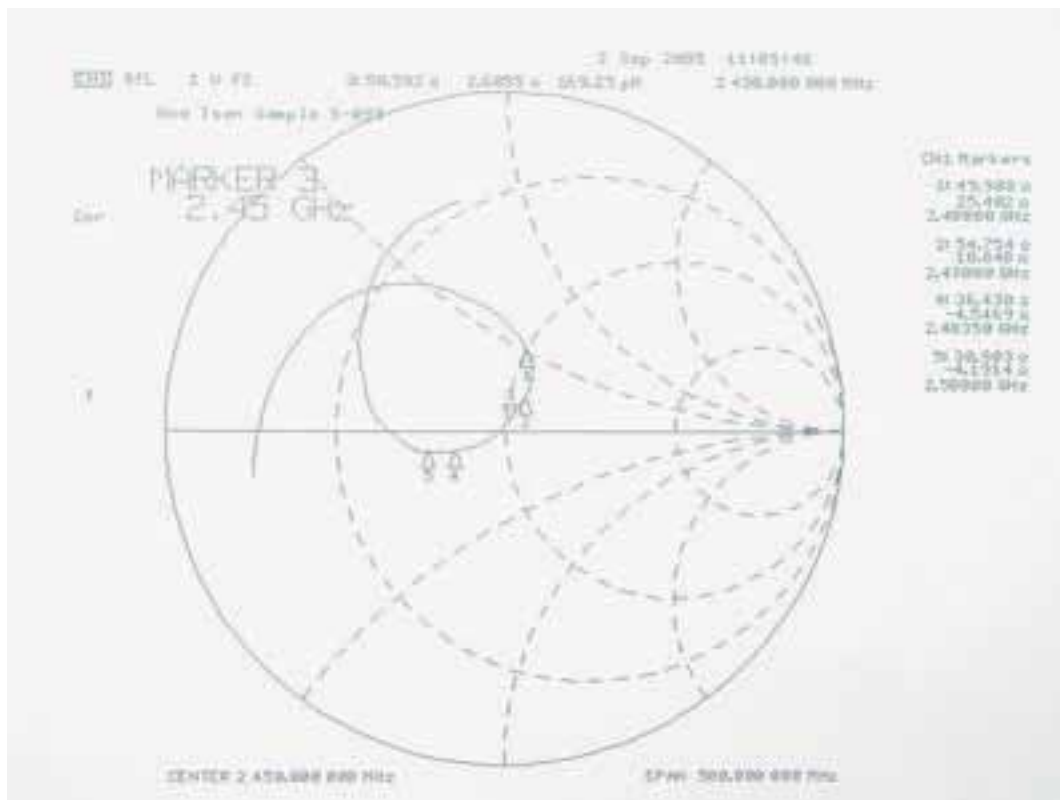
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TESTER:

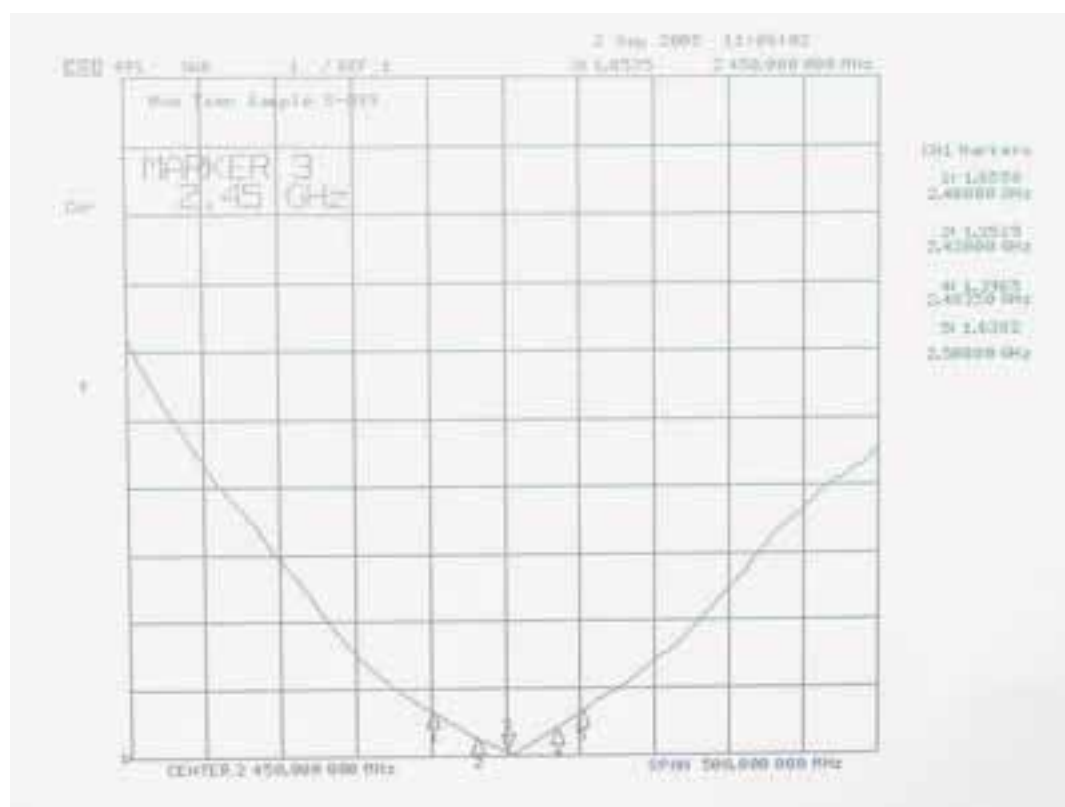
Return Loss



Smith Chart



V.S.W.R



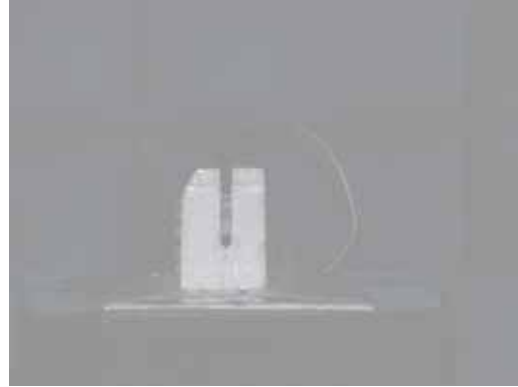
HOW TSEN INTL. ELECTRONICS METAL CO.,LTD.

S-099

1. Photographs

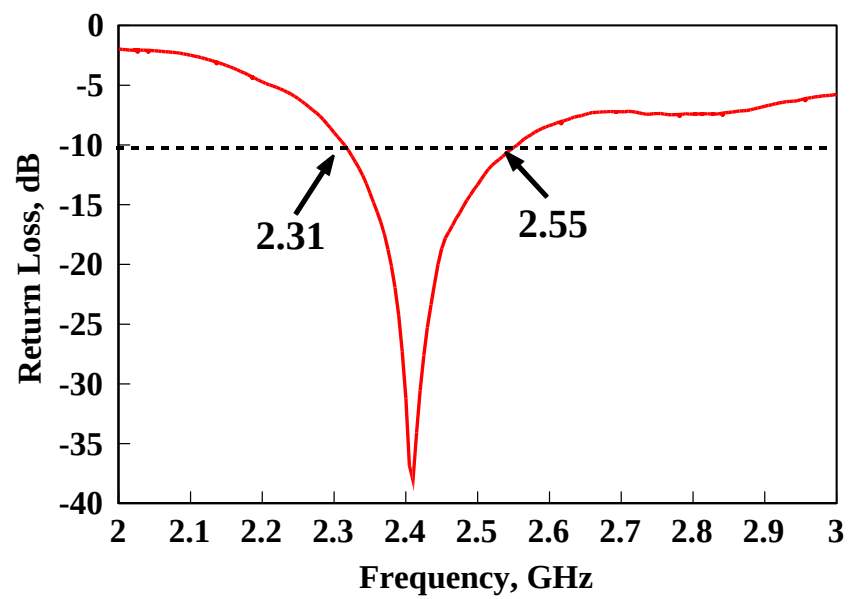


E-Plane



H-Plane

2. Measured Return Loss



3. Radiation Patterns

Gain: 2.0dBi @ 2.4GHz

