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	**:**	NJ2WX54G
Product name	**:**	Wireless Access Extension
Model name	**:**	WX-54G
Classification	**:**	Mobile Device (i) Under normal use condition, the antenna is at least 20cm away from the user; (ii) Warning statement for keeping 20cm separation distance and the prohibition of operating next to the person has been printed in the user' s manual
Frequency Range	**:**	2.412 GHz ~ 2.462GHz
Supported Channel	**:**	11 Channels
Modulation Skill	**:**	DBPSK, DQPSK, CCK, OFDM
Power Type	**:**	Powered by AC/DC adapter

3. Limits for *Maximum Permissible Exposure (MPE)*

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Filed Strength (H) (A/m)	Power Density (S) (mW/cm2)	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:**

Friis Transmission Formula: $S = \frac{PG}{4\pi R^2} = \frac{557.19 \times 1.96789}{4\pi (20)^2} = 0.218 mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{557.19 \times 1.96789}{4\pi}} = 9.341 cm$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 9.34cm."

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 = Log $^{-1}$ (***dB*** antenna gain / 10)

G1 = Log $^{-1}$ (2.94 / 10) = 1.96789 ; G2 = Log $^{-1}$ (2.0 / 10) = 1.58489

Appendix

Antenna Specification

金橋科技
GoldenBridge

Moving Antenna Specification

CUSTOMER 華碩

CUSTOMER P/N

PRODUCT 2.4-2.5GHz Moving Antenna
With RSMA CON. (cable L=800mm)

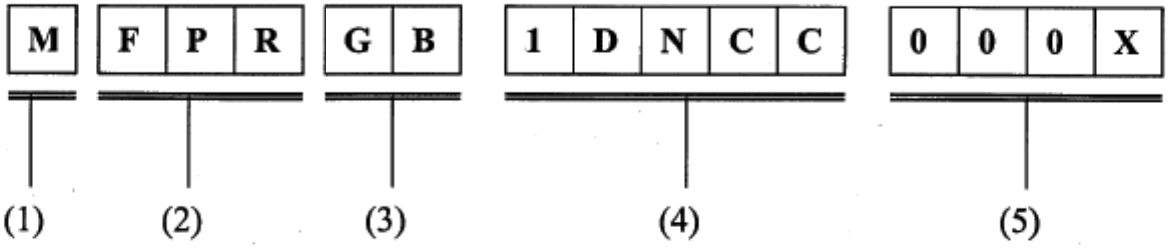
SAMPLE P/N MFPRGB1DNCC000X

SUPPLIER	金橋 經1部 李向宏	金橋 四+1 江勝吉	金橋 經1部 陳卓志
APPROVED			

Golden Bridge Electech Inc.
3F., NO.6, LANE270, SEC.3, Pei Shen RD. , SHEN KENG, TAIPEI TAIWAN, R.O.C.
TEL : 886-2-2662-7300 FAX : 886-2-2662-0642
http : // www . gbe . com . tw

二、Specification

1. Explanation of Part Number



(1) Product Division : M

(2) Product code : FPR

(3) Design Source : GB

(4) Product Type : 1DNCC

(5) Figure Model : 000X

Golden Bridge Electech Inc.
3F., NO.6, LANE270, SEC.3, Pei Shen RD. , SHEN KENG, TAIPEI TAIWAN, R.O.C.
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http : // www . gbe . com . tw
1 April 2004

2. Electrical & Physical Properties

➢ Electrical Properties

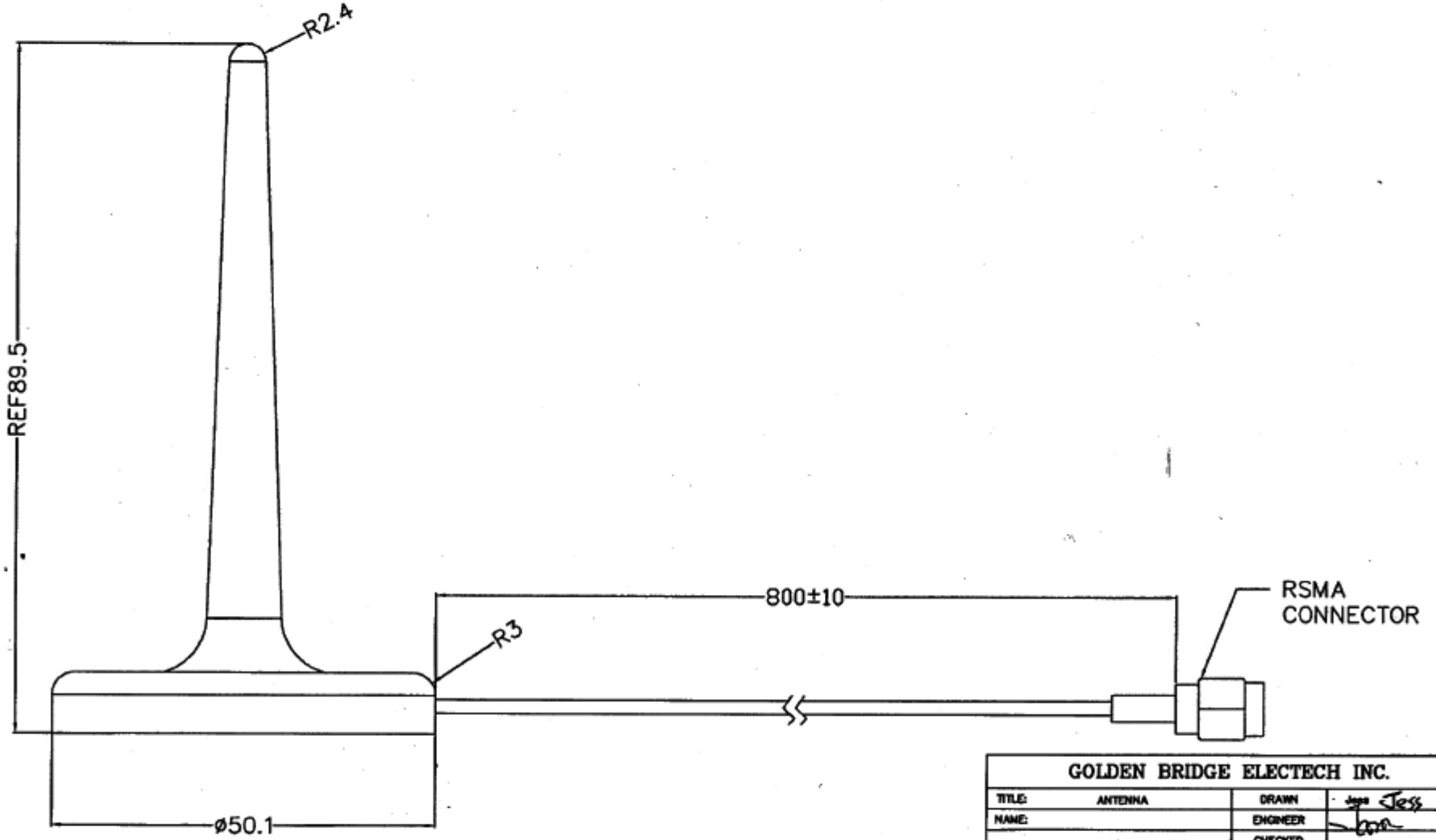
Frequency	2.4~2.5GHz
VSWR	VSWR≦1.4
Return Loss	-16dB max
Peak Gain(2.4~2.5GHz)	2.9385 dBi
Impedance	50 ohm
Radiation	Omni
Polarization	Vertical
Electrical wave	1/2 λ dipole

➢ Physical Properties

Cable	RG-178
Impedance	50 ohm
Antenna Cover	TPU
Antenna Base	Steel
Color	Black
Connector	RSMA

Golden Bridge Electech Inc.
3F., NO.6, LANE270, SEC.3, Pei Shen RD. , SHEN KENG, TAIPEI TAIWAN, R.O.C.
TEL：886-2-2662-7300 FAX：886-2-2662-0642
http : // www . gbe . com . tw
1 April 2004

ISSUE	QT'Y	ECN NO.	REVISED DESCRIPTION	DATE	APPROVED
0					



GOLDEN BRIDGE ELECTECH INC.			
TITLE: ANTENNA		DRAWN	Jess
NAME:		ENGINEER	
SPEC:		CHECKED	
		APPROVED	

SYMBOL	QT'Y	DESCRIPTION	DRAWING NO.	MBSRSP04662000X
⊠	0	CRITICAL DIMENSION	REVISION	
□	0	MAJOR DIMENSION	UNIT	mm
TOLERANCES UNLESS OTHERWISE SPECIFY ≥0.5~3=±0.15 ≥30~120=±0.8 ≥3~6=±0.2 ≥120~315=±1.2 ≥6~30=±0.5 ANGLE=±1°			SCALE	2:1
			PAGE NO.	1 OF 1
			DATE	2004.04.01

A3

WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)
TAI HWA ELECTRONIC CO., LTD.(CHINA)
SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA
AEON TECH CO., LTD. (CHINA)

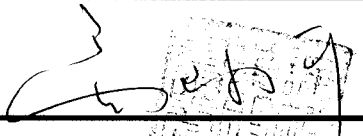
SPECIFICATION FOR APPROVAL

CUSTOMER: *華碩科技股份有限公司*

PART NAME: ***RF Antenna Assembly***

PART NO.: ***12-230003070*** ***REVISION:***

W. Y. P/NO.: ***C660-510004-A*** ***REV.:*** ***X2***

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :		

WHA YU GROUP

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Fax: + 86-21-59741347

SU ZHOU AEON TECH CO., LTD. (CHINA)
蘇州華廣電通有限公司
Address:Limin North Road, LiLi Town,LiLi Industrial Park,LinHu Economic Zone
Wujiang City,Jiangsu Province,China
Tel: + 86-512-63627980
Fax: + 86-512-63627981

RF Antenna Cable Assembly

Specification

1. Electrical Properties :

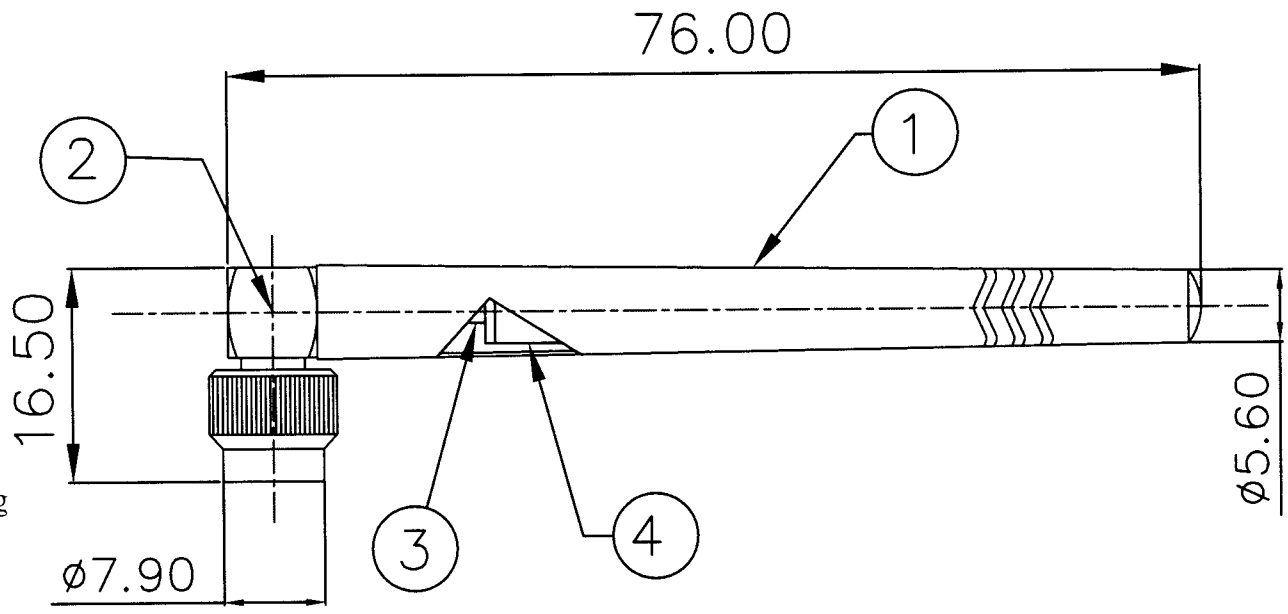
1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
1.2 Impedance ..... 50Ω Nominal
1.3 VSWR ..... 1.92 Max.
1.4 Return Loss..... -10dB Maximum
1.5 Electrical Wave..... 1/2 λ Diople
1.6 Gain..... 2.0 dBi
1.7 Admitted Power..... 1W

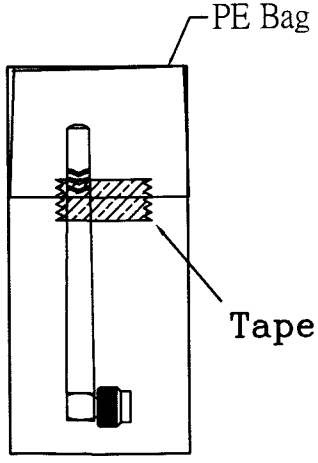
2. Physical Properties :

2.1 Cable ..... RG-178 Coaxial Cable
2.2 Antenna Cover ..... TPR TS-95
2.3 Operating Temp ..... -20℃ ~ +65℃
2.4 Storage Temp ..... -30℃ ~ +75℃
2.5 Color ..... Black
2.6 Connector ..... SMA Plug R/A Reverse Cr Plated

CG-

REV	DATE	DESCRIPTION
X1	03/09-2004	New Issue
X2	09/20-2004	Changed Packing





Packing : 1PCS/Bag

NO	DESCRIPTION	QTY	REMARK
4	Ground Tube — Brass ,Ni Plated	1	
3	Cable — RG-178 ,50Ω ,Translucent Brown	1	
2	Connector — SMA Plug R/A Reverse ,Cr Plated	1	
1	Antenna Body — TPR TS-95 ; Color : Black	1	

CUSTOMER'S SINGATURE

XX.	±3.0
X.	±2.0
.X	±1.0
.XX	±0.5
.XXX	±0.1

APPROVED 9/20/2004
CHECKED 09/20-04
DRAWING 黃惠記

CUSTOMER:	華碩科技股份有限公司
PART NO :	12-230003070
PARTNAME:	SMA RF Antenna
W.Y P/NO :	C660-510004-A

REV	UNIT	FILE :
X2	m/m	SHEET : 1/1

Wha Yu
INDUSTRIAL CO.,LTD.
譁裕實業股份有限公司

Cable Specification

Cable : Mil-C-17 Coaxial Cable RG-178

1. Construction :
   - 1 Conductor..... **30AWG 7/38 SCCS**
   - 2 Dielectric..... PTFE OD : 0.033"±0.002"
   - 3 Shielded.....38AWG SPC OD : 0.051" Nominal
   - 4 Jacket.....FEP OD : 0.071"±0.004"

2. Physical Properities :
   - 1 Weight per 1000ft..... 6.3 lbs Maximum
   - 2 Bend Radius.....0.35" Mininum
   - 3 Operating Temperature Range -55℃~ 200℃

3. Electrical Properities:
   - 1 Impedance..... 50±2 ohms
   - 2 Capacitance..... 32 pF/ft Maximum
   - 3 Cut off Frequency..... 116 GHz
   - 4 Attenuation.....45.0 dB/100ft @ 1GHz
     64.4 dB/100ft @ 2GHz
     79.7 dB/100ft @ 3GHz
     92.7 dB/100ft @ 4GHz
     104.3 dB/100ft @ 5GHz
     115.0 dB/100ft @ 6GHz