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	**:**	VUIAWM6018P
Product name	**:**	WIFI module
Model	**:**	AWM6018-P
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 mini-PCI interface

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: $S = \frac{PG}{4\pi R^2} = \frac{312.61 \times 2.59}{4\pi (20)^2} = 0.161 mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{312.61 \times 2.59}{4\pi}} = 8.03 cm$

Remarks: *"The safe estimated separation that the user must maintain from the antenna is at least 5.8cm"*

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)

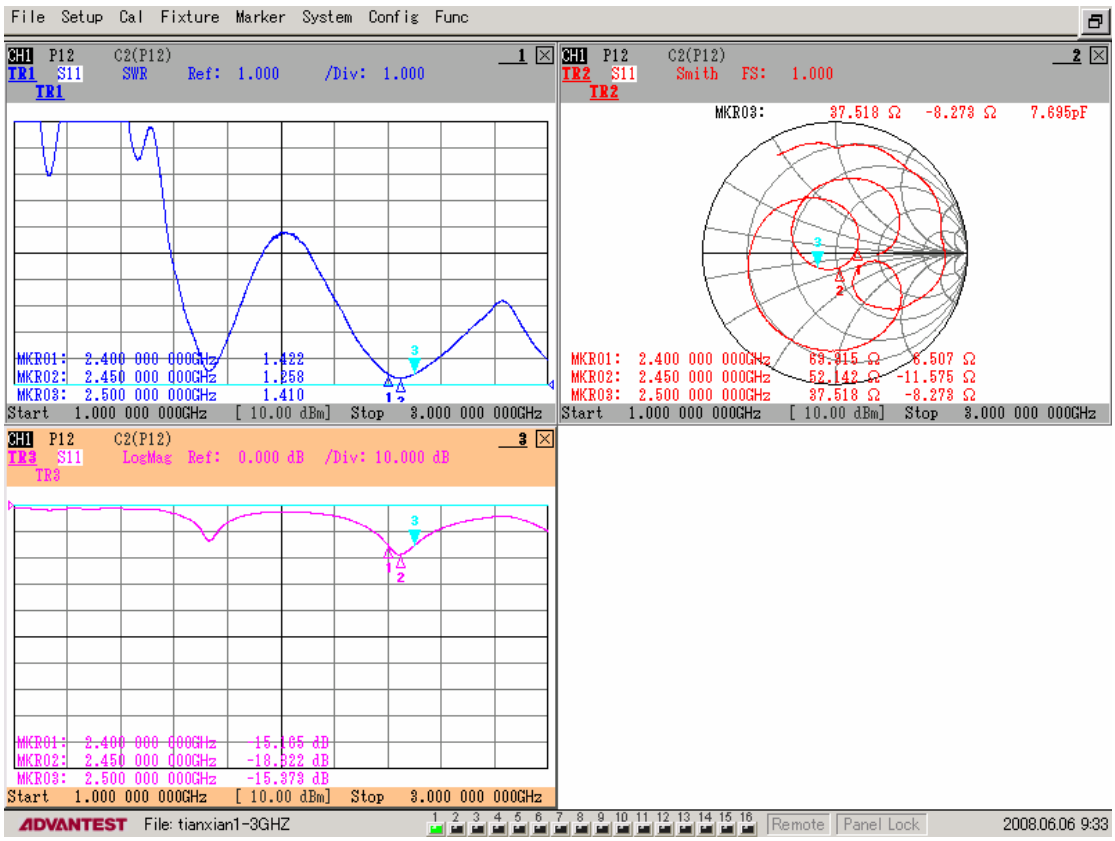
G = Log $^{-1}$ (4.14 / 10) = 2.59

Appendix

Antenna Specification
(Antenna#1 Dipole Antenna)

RFAntenna Assembly

P/NO:C660S510211-A SPEC : 2.4~2.5GHz NO:SSR-82184



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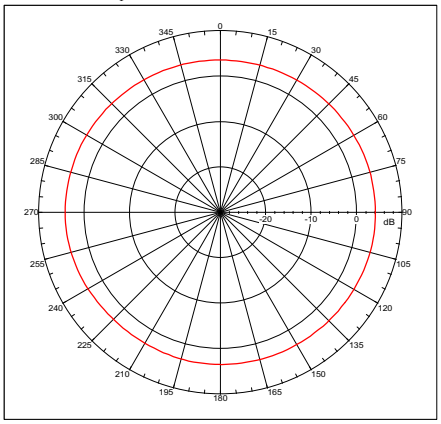
RF Antenna Assembly

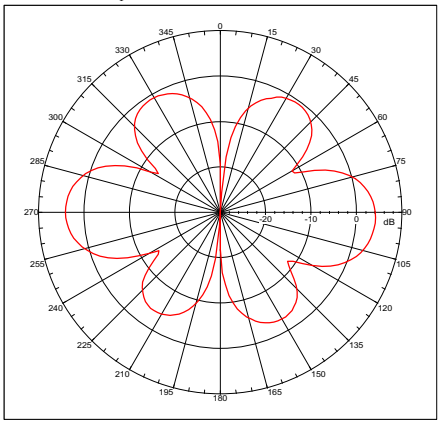
P/NO: C660S510211-A SPEC:2.4~2.5GHz NO:SSR-82184

Far-field amplitude of C660S510211-A SSR-82184-V.nsi



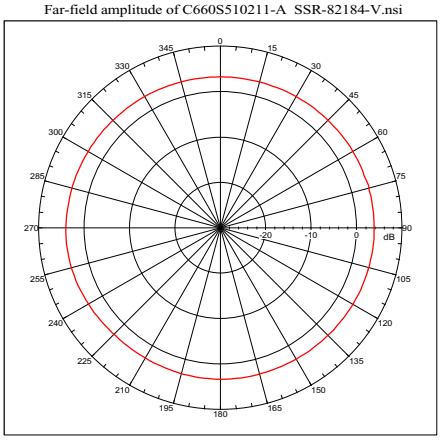
2.4GHz Gain=4.14363dBi

Far-field amplitude of C660S510211-A SSR-82184-H.nsi



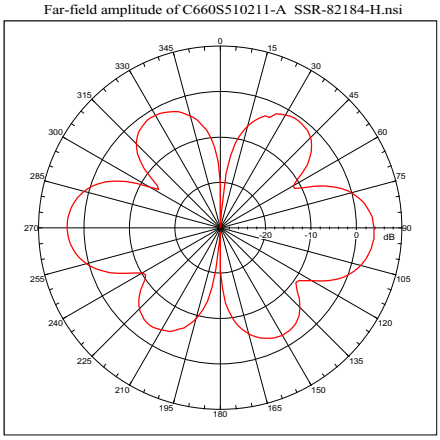
2.4GHz Gain =4.14329dBi

Far-field amplitude of C660S510211-A SSR-82184-V.nsi



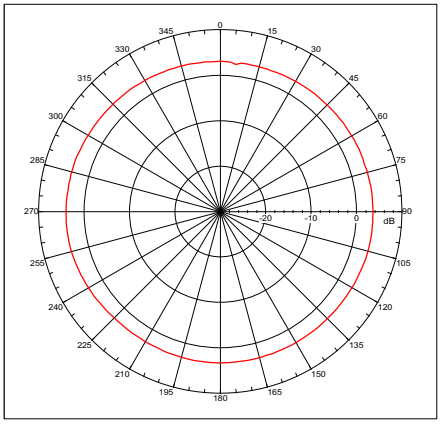
2.45GHz Gain =3.98819dBi

Far-field amplitude of C660S510211-A SSR-82184-H.nsi



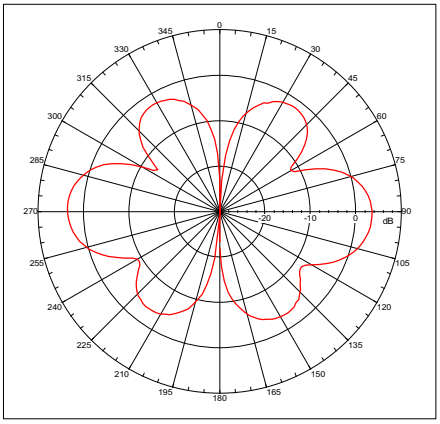
2.45GHz Gain =3.83412dBi

Far-field amplitude of C660S510211-A SSR-82184-V.nsi



2.5GHz Gain = 3.98765dBi

Far-field amplitude of C660S510211-A SSR-82184-H.nsi



2.5GHz Gain =3.53263dBi

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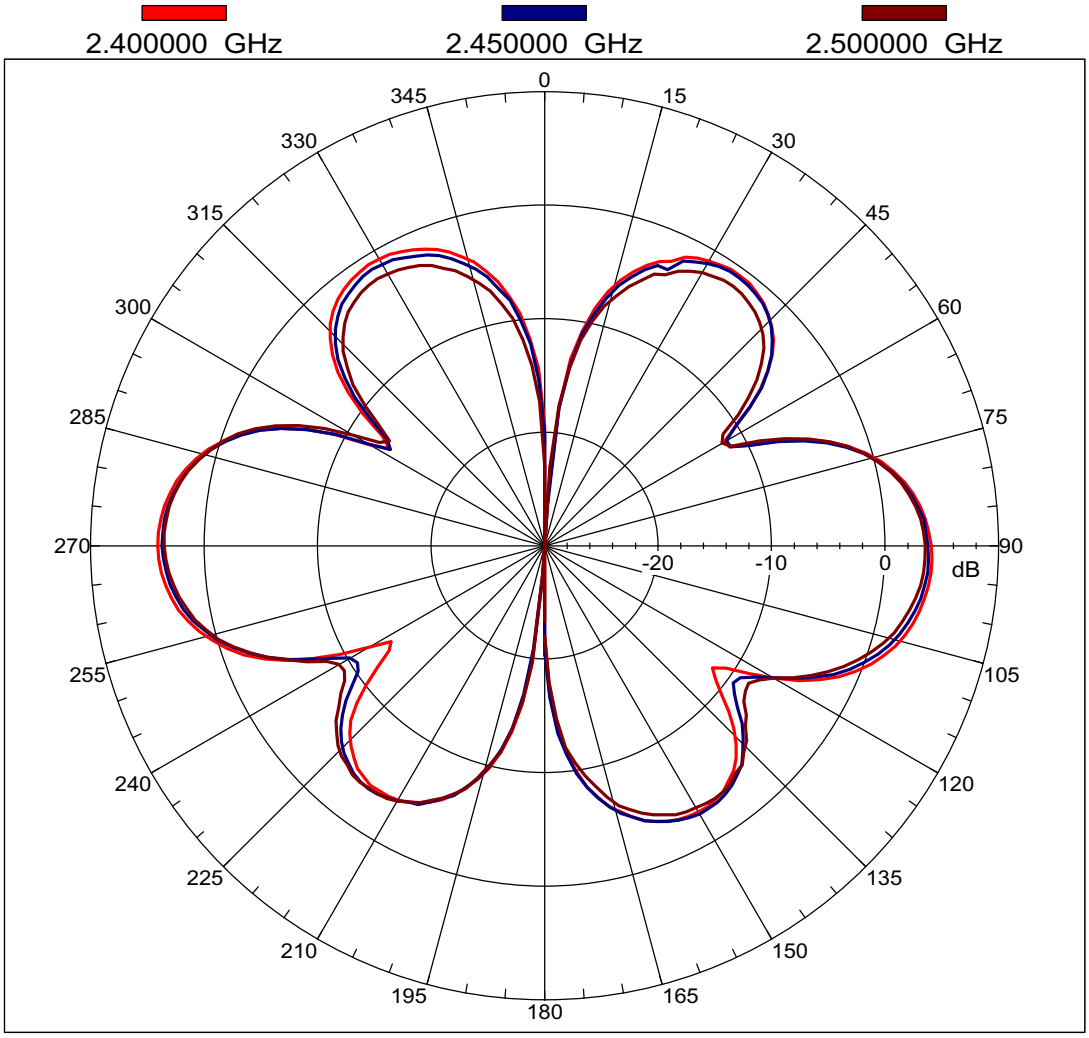
RF Antenna Assembly

P/NO: C660S510211-A SPEC:2.4~2.5GHz NO:SSR-82184

Far-field amplitude of C660S510211-A SSR-82184-H.nsi



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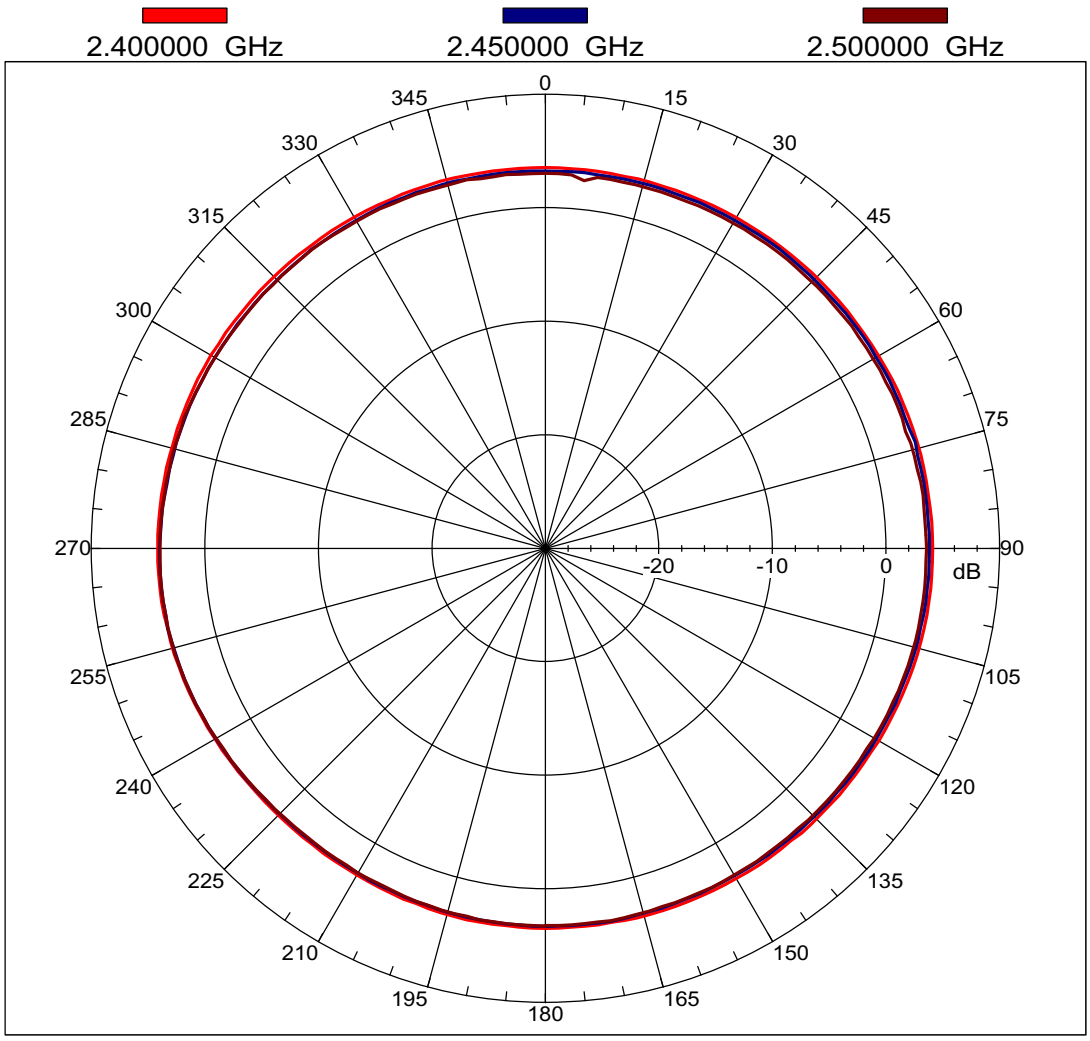
RF Antenna Assembly

P/NO: C660S510211-A SPEC:2.4~2.5GHz NO:SSR-82184

Far-field amplitude of C660S510211-A SSR-82184-V.nsi



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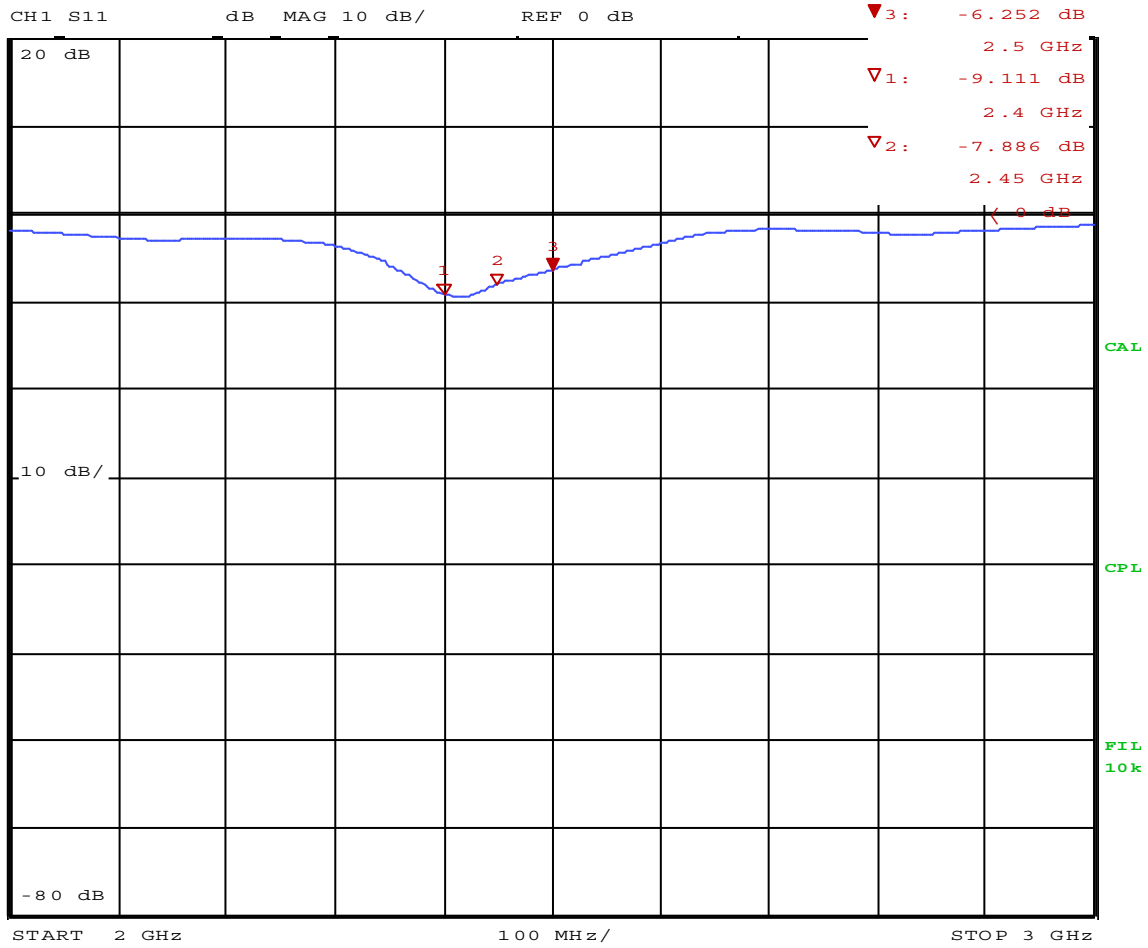
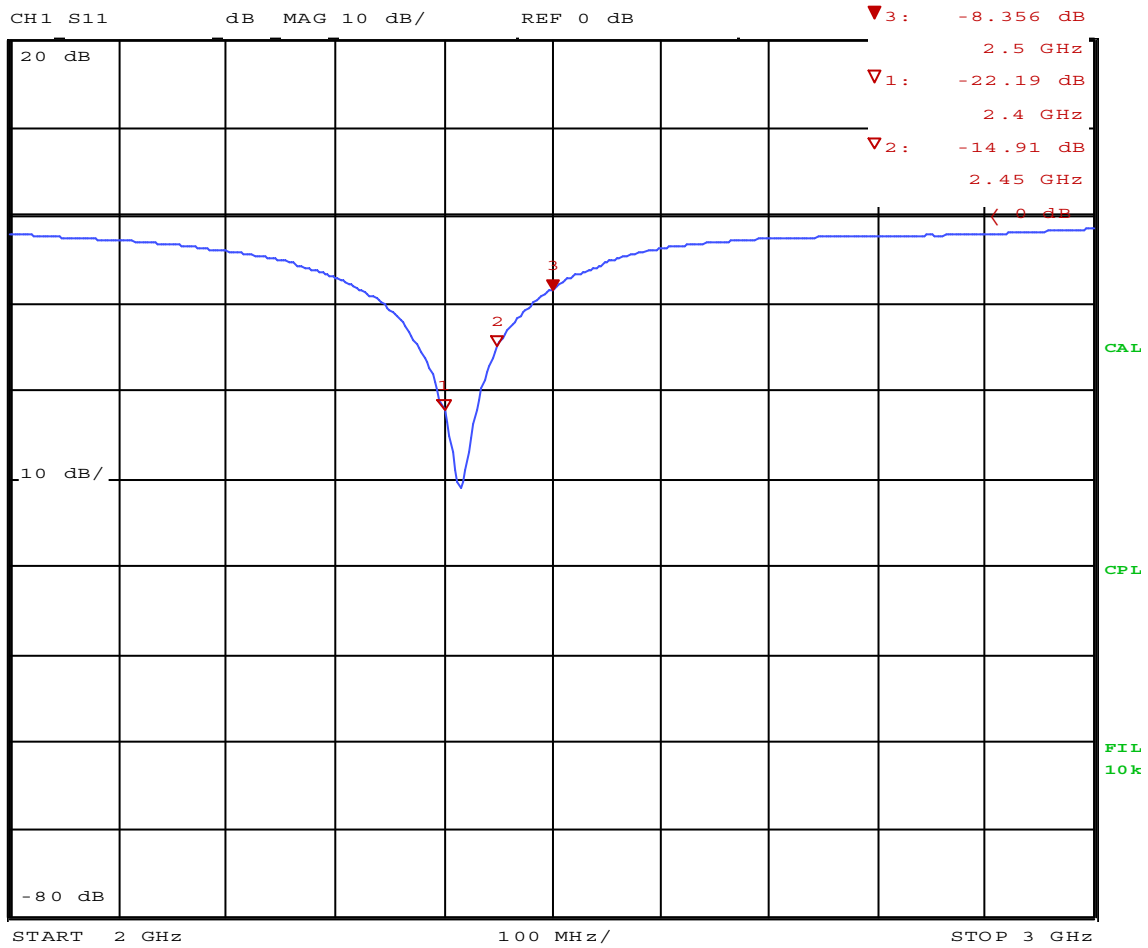
Appendix

Antenna Specification
(Antenna#2 Printed Antenna)



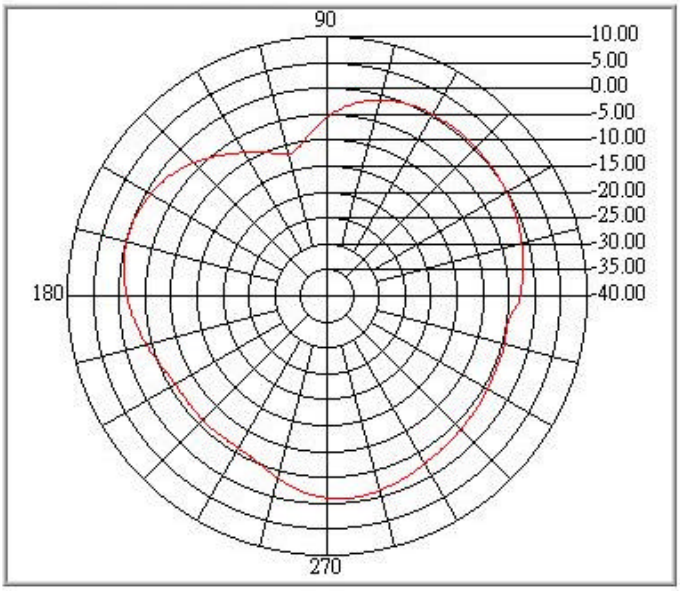
Date: 28.MAR.03 02:18:30



Date: 28.MAR.03 02:14:25

Model No: WL120G-X **Antenna Position**: Horizontal

Frequency 2450.00 **MHz**



Peak: 0.55 dBi **Peak Angle**: 49.59 Degree

Average: -3.28 dBi

Test engineer:_____

Test date: 2003/4/1 at AM 08:49

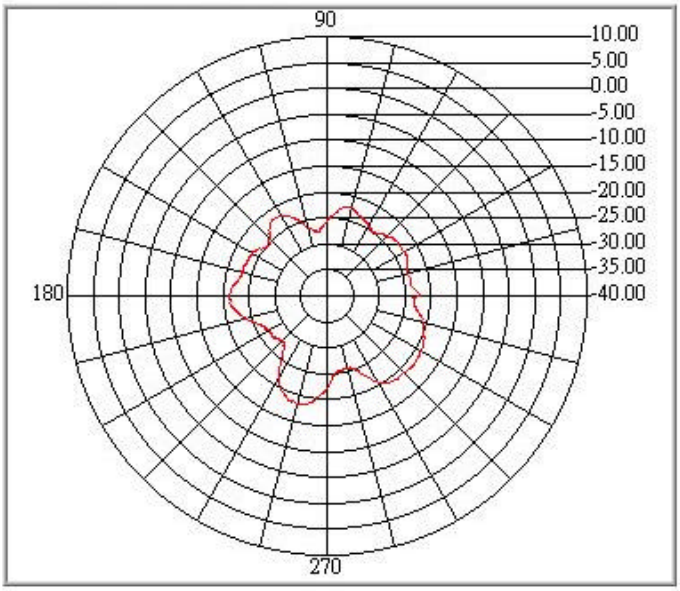
Traininig Research Co., Ltd.

Tel: 02-26935155 Fax: 02-26934440

URL: http://www.trclab.com.tw

Model No: WL120G-X **Antenna Position**: Vertical

Frequency 2450.00 **MHz**



Peak: -18.39 dBi **Peak Angle**: 254.08 Degree

Average: -23.06dBi

Test engineer:_____

Test date: 2003/4/1 at AM 08:46

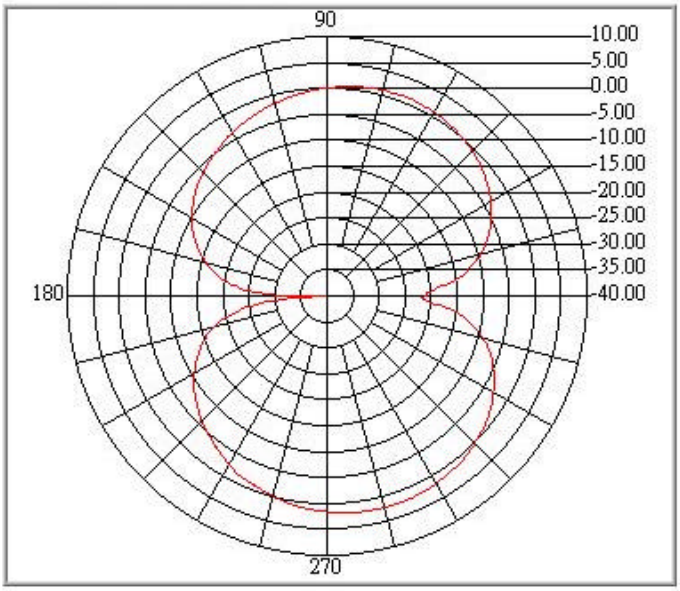
Traininig Research Co., Ltd.

Tel: 02-26935155 Fax: 02-26934440

URL: http://www.trclab.com.tw

Model No: WL120G-Y **Antenna Position**: Horizontal

Frequency 2450.00 **MHz**



Peak: 2.24 dBi **Peak Angle**: 284.69 Degree

Average: -5.91 dBi

Test engineer:_____

Test date: 2003/4/1 at AM 08:57

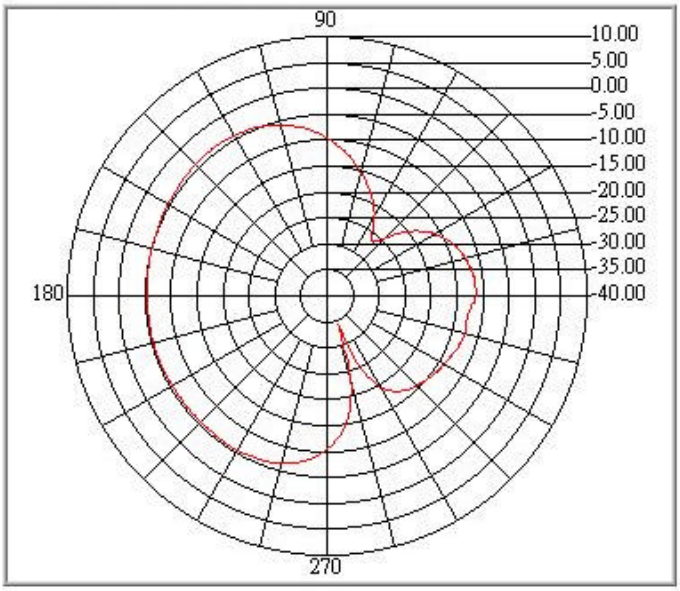
Traininig Research Co., Ltd.

Tel: 02-26935155 Fax: 02-26934440

URL: http://www.trclab.com.tw

Model No: WL120G-Y **Antenna Position**: Vertical

Frequency 2450.00 **MHz**



Peak: -4.04 dBi **Peak Angle**: 127.96 Degree

Average: -11.1dBi

Test engineer:_____

Test date: 2003/4/1 at AM 08:58

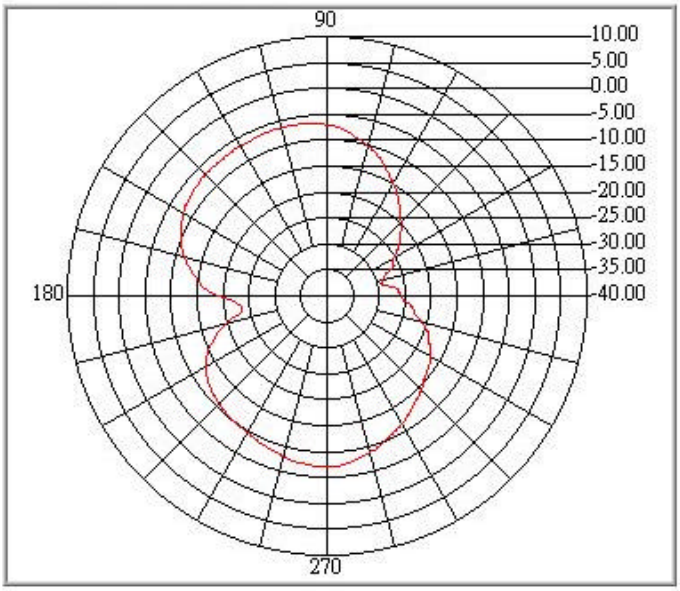
Traininig Research Co., Ltd.

Tel: 02-26935155 Fax: 02-26934440

URL: http://www.trclab.com.tw

Model No: WL120G-Z **Antenna Position**: Horizontal

Frequency 2450.00 **MHz**



Peak: -6.37 dBi **Peak Angle**: 105.88 Degree

Average: -13.80dBi

Test engineer:_____

Test date: 2003/4/1 at AM 09:03

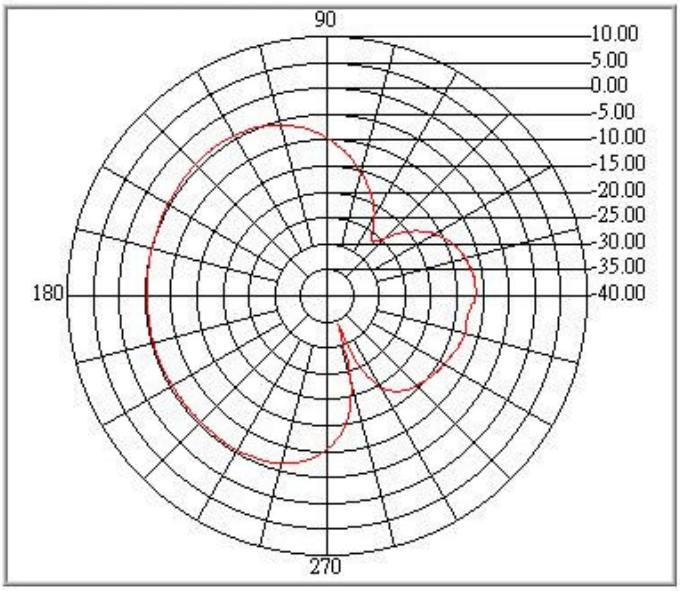
Traininig Research Co., Ltd.

Tel: 02-26935155 Fax: 02-26934440

URL: http://www.trclab.com.tw

Model No: WL120G-Y **Antenna Position**: Vertical

Frequency 2450.00 **MHz**



Peak: -4.04 dBi **Peak Angle**: 127.96 Degree

Average: -11.1dBi

Test engineer:_____

Test date: 2003/4/1 at AM 08:58

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