

SPECIFICATIONS AND  
APPLICATION NOTES

May 21, 2002

# BlueChip™ Antenna



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## Technology

The BlueChip™ is a versatile and easy to use antenna for the 2.4 to 2.5 GHz frequency band used by Bluetooth and IEEE 802.11b devices. Designed for high volume pick-and-place manufacturing processes, it can be successfully used in many different applications.



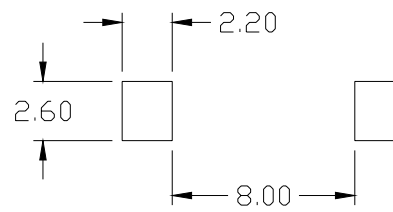
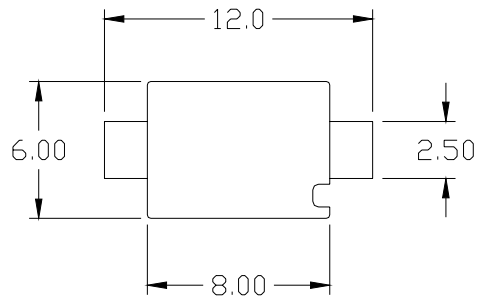
With proper modification to the PCB, the Bluechip can be configured to cover the 2.4 GHz and 5.2 GHz bands simultaneously. In fact with proper tuning technique, the Bluechip can exhibit greater than 3 GHz instantaneous bandwidth (3-6 GHz) with VSWR < 2:1 for future Ultra Wideband (UWB) applications.

The BlueChip™ is a standard  $\frac{1}{4}$ -wave antenna in a miniature package. As a  $\frac{1}{4}$ -wave antenna, BlueChip™ requires a ground plane to radiate efficiently. Thus, the ground plane configuration of the device in which the BlueChip™ is installed will have a significant impact on electrical performance (VSWR and gain). The polarization and radiation patterns are also affected by ground plane size, placement and geometry.

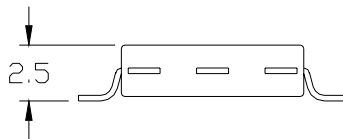
There are many ground plane configurations that will provide a 50 ohm impedance match for the antenna. Contact Centurion Wireless for engineering assistance with your custom application.

## Physical Dimensions

- BlueChip™ Radiating Element Size: 8mm x 6mm x 2.5mm (l x w x h)
- Overall Length with Solder Tabs: 12mm
- Physical Mass: 0.21 grams



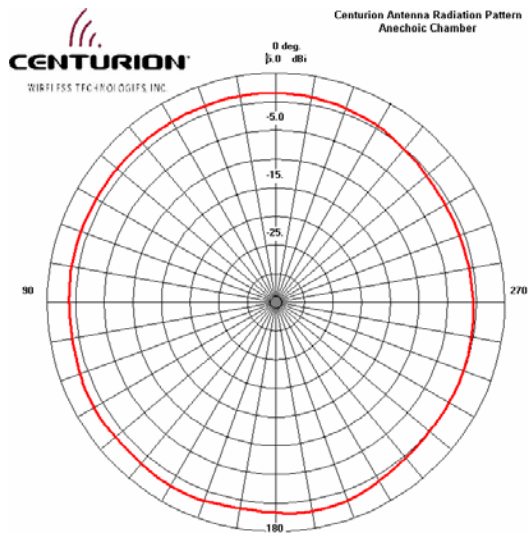
SOLDER PAD LAYOUT



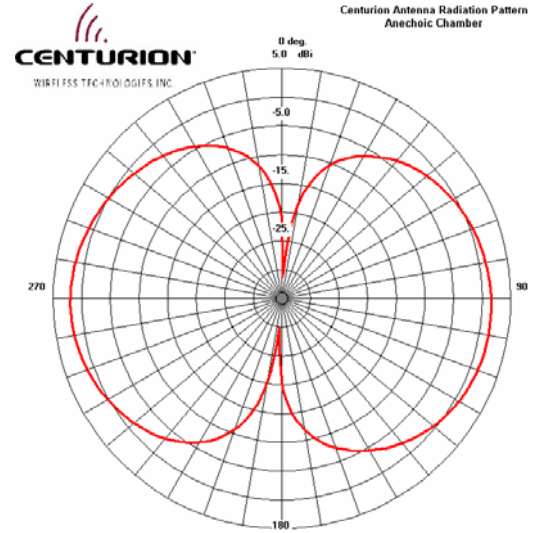
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## Electrical Performance

- VSWR < 2.0:1 from 2.4 GHz to 2.5 GHz
- Peak Gain > 2 dBi (azimuth plane – vertical polarization)
- Average Gain > 0 dBi (azimuth plane – vertical polarization)



**FIGURE 1a: AZIMUTH PLANE**

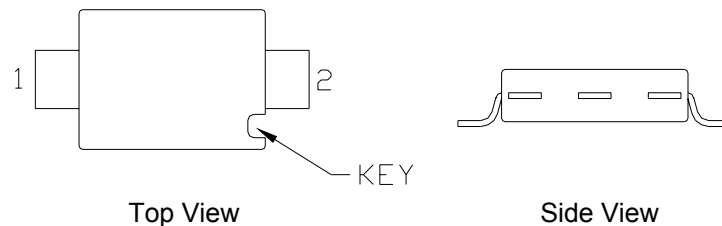


**FIGURE 1b: ELEVATION PLANE**

Specifications subject to change without notice

## Feed Configuration

- BlueChip™ has two tabs for solder attachment to PCB solder pads
- Tab #1 is for the RF feedline
  - line impedance must be 50 ohms for optimum antenna performance
- Tab #2 is primarily for mechanical support
  - identified by the notch or “key” adjacent to it
  - should NOT be connected to the PCB ground plane
  - may be used for tuning the BlueChip™ by capacitive loading (contact Centurion Wireless RF engineering for details)



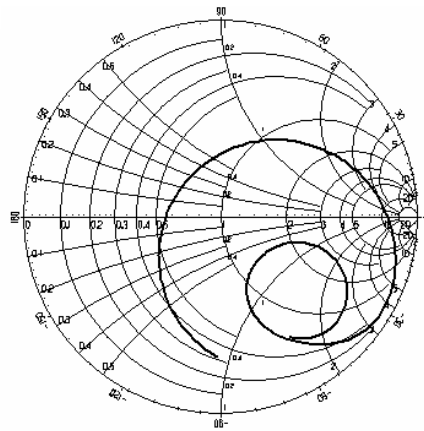
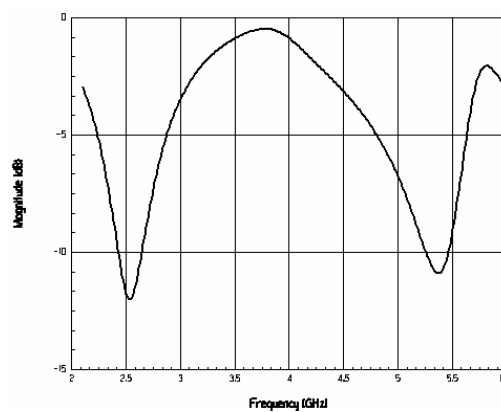
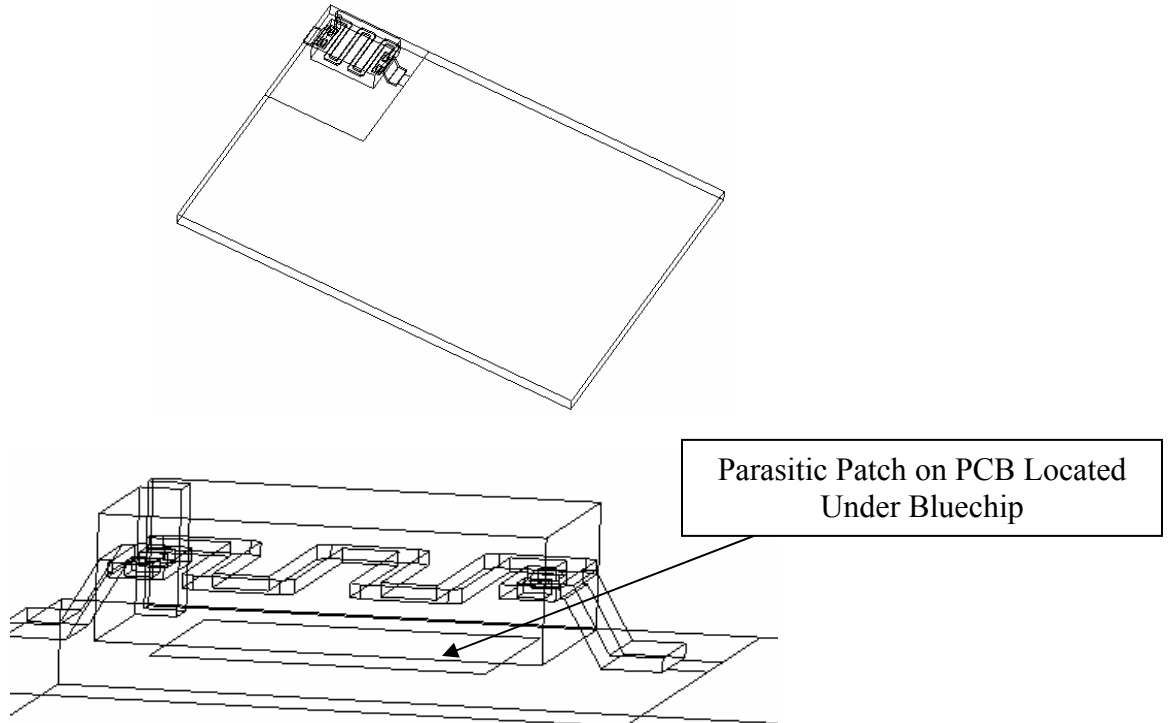
**FIGURE 2: BlueChip™ MECHANICAL VIEW**

## Single Band Tuning Techniques (2.4 GHz)

- Electrical performance of the BlueChip™ antenna is influenced by the physical characteristics of the surrounding devices and materials. This can be used as an advantage by manipulating certain parameters to overcome induced parasitics.
  - PCB substrate thickness
  - PCB substrate dielectric constant
  - Ground plane configuration
    - Distance from antenna
    - Topology around antenna
  - Feed point transmission line impedance
    - Trace width
    - Trace length
  - Capacitive loading
    - Enlarge or extend the solder pad for Tab #2
    - Adjust length and width of the extended Tab

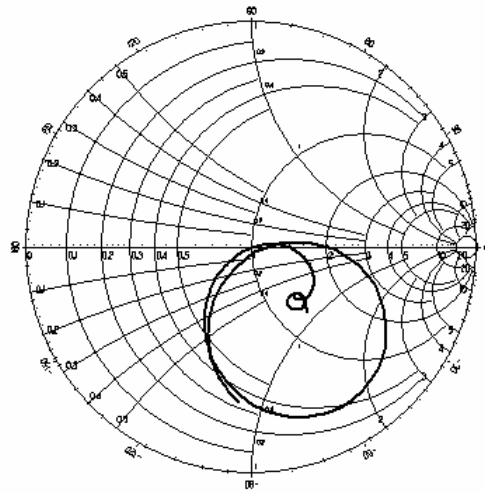
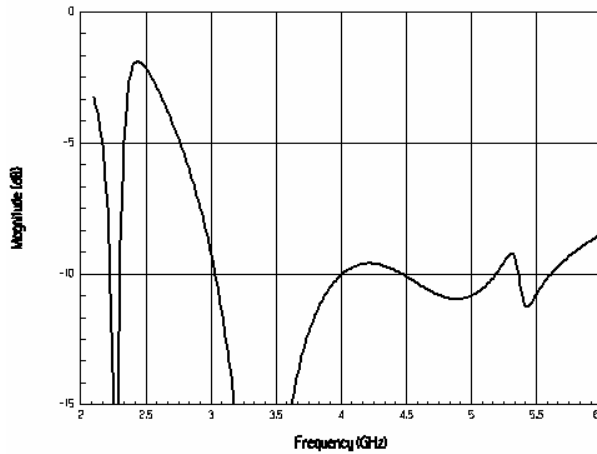
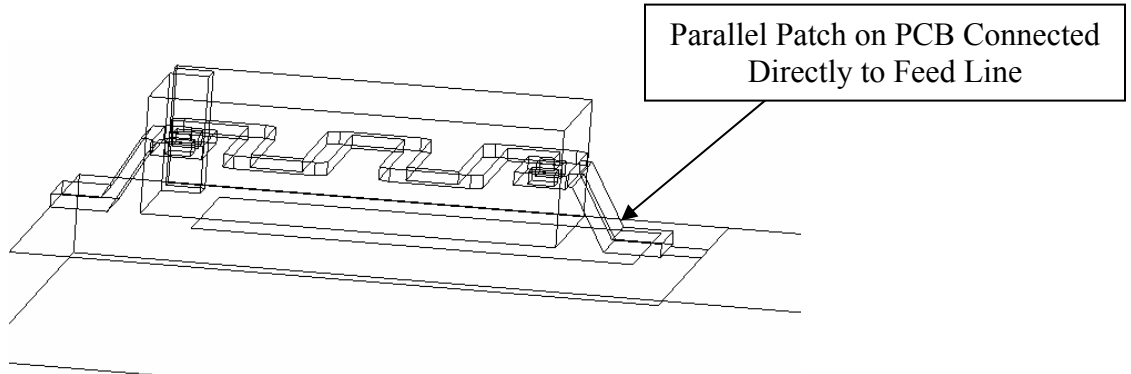
## Dual- Band Tuning Technique (2.4 & 5.2 GHz)

- A parasitic patch element, capacitively coupled to the Bluechip feed line, will broaden and move the second resonance.
  - Useful for 802.11(a) and (b) applications
  - Excellent choice for PCMCIA form factor



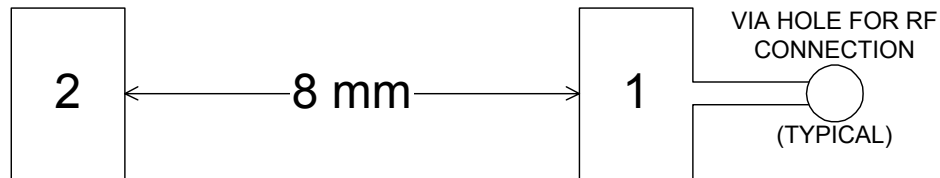
## UWB - Band Tuning Technique (2.4 & 3-6 GHz)

- A parallel patch, directly connected to the feed of the meander line, will cause very large bandwidth enhancement.
  - Useful for 802.11(a), (b), HyperLan and UWB Applications
  - Excellent choice for PCMCIA form factor



## PCB Solder Pad Size and Placement

- Two solder pads are required for attachment to a PC board
- Solder pads on the PCB should be 2.6mm x 2.2mm and spaced 8 mm apart
- BlueChip™ antenna may be attached by reflow, wave or hand soldering operations



**FIGURE 3: BlueChip™ TYPICAL PCB SOLDER PAD LAYOUT**

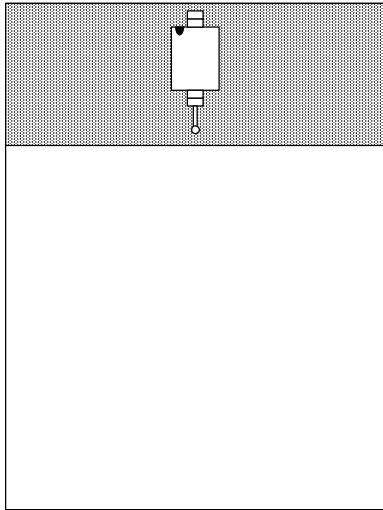
## Ground Plane Restrictions

- The PCB ground plane must not extend under the BlueChip™ antenna
- The PCB ground plane must not extend closer than within 3mm of the BlueChip™ antenna

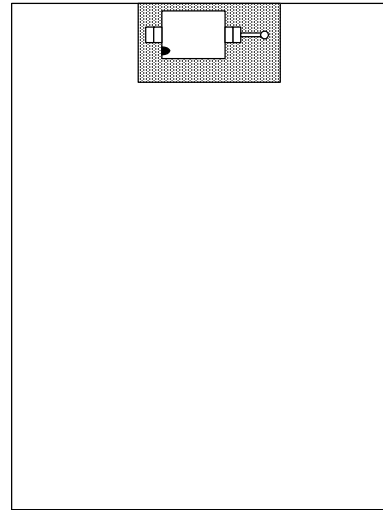
Specifications subject to change without notice

## Typical Device Configurations

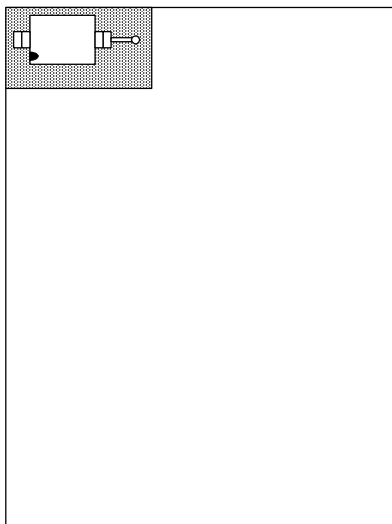
Note: Drawings not to scale.



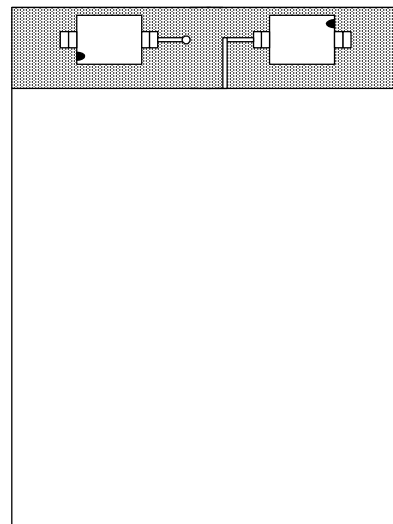
**Top Mount**



**Top Mount**



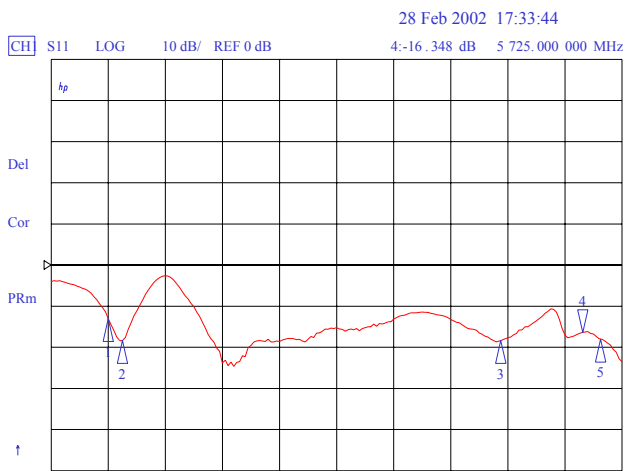
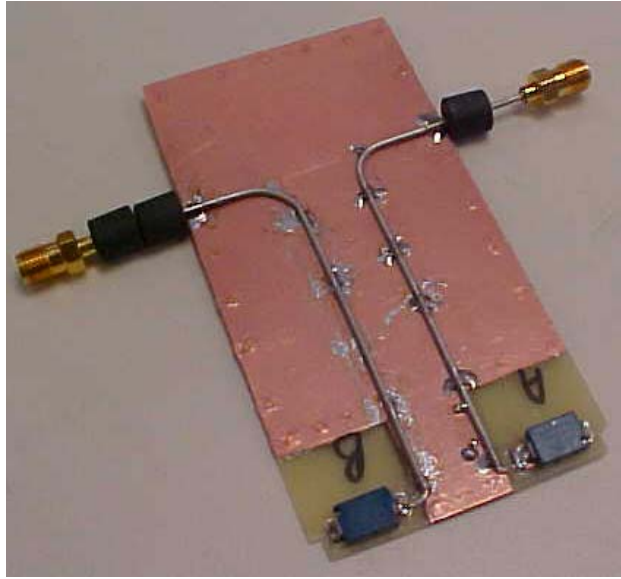
**Corner Mount**



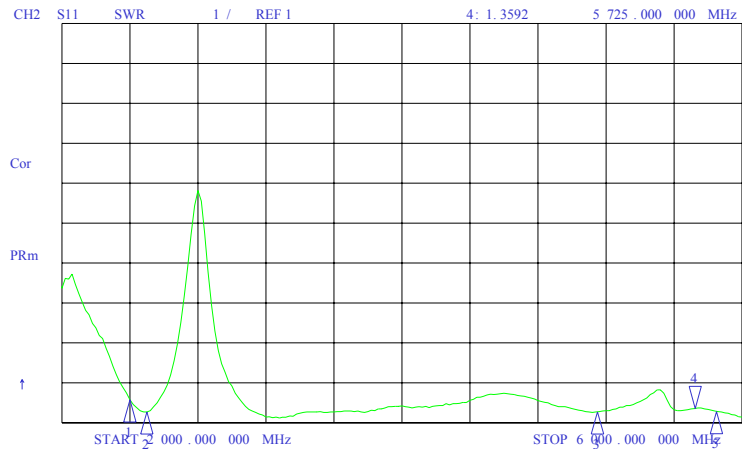
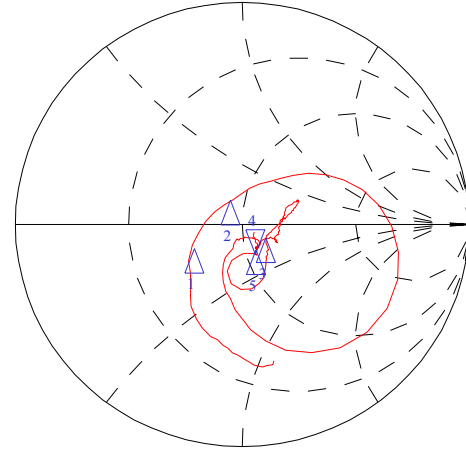
**Dipole (Dual BlueChip™)**

The configurations shown above are only a small sample of the many custom layouts that can be used. Contact Centurion Wireless RF engineering for assistance with your custom application.

## UWB PCMCIA Diversity Configuration



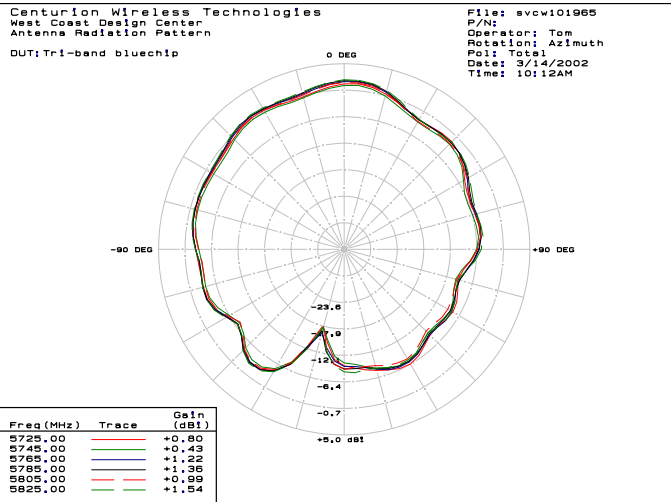
4: 54.172  $\Omega$  -14.920  $\Omega$  1.8633 pF



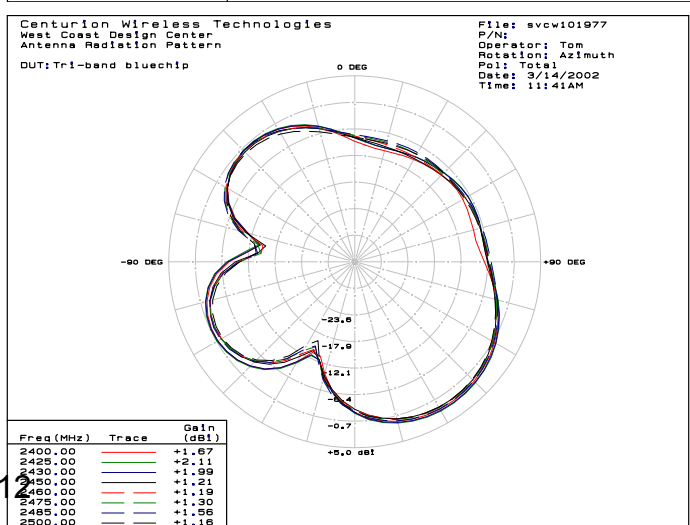
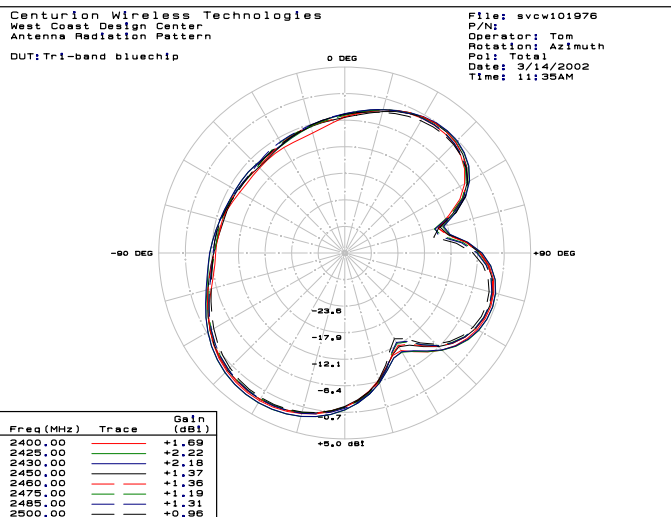
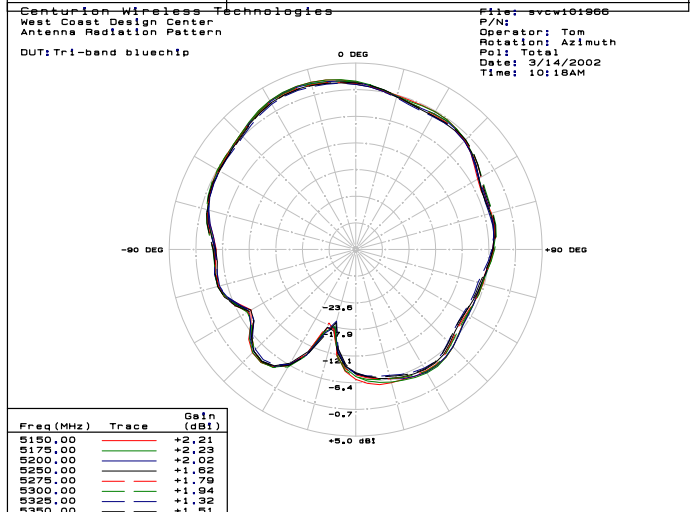
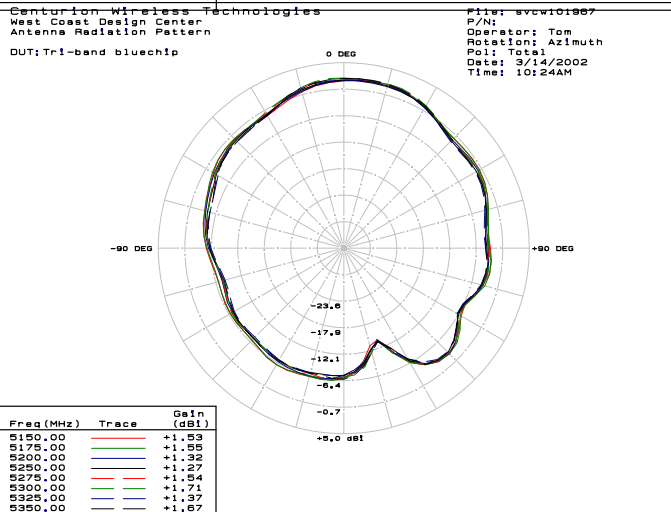
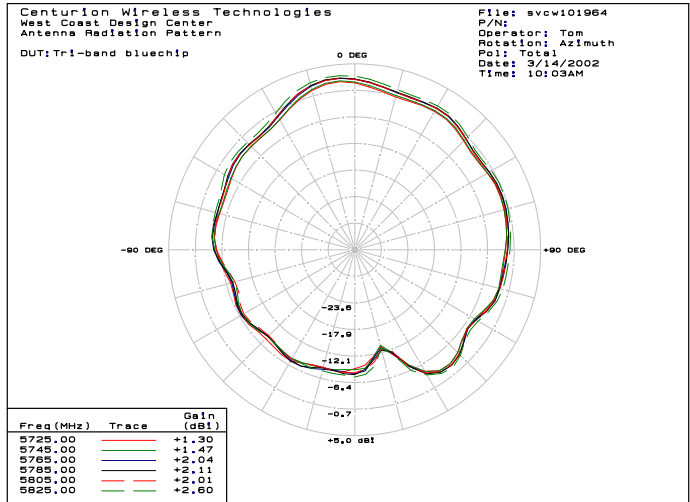
## Azimuth Cut Antenna Patterns

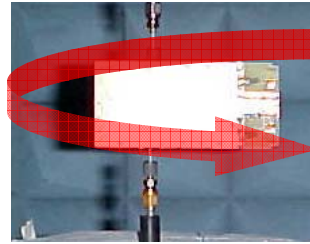


**Antenna A**



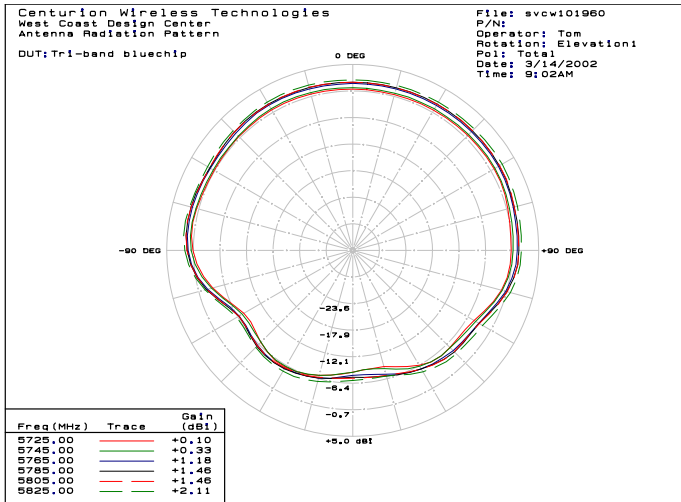
**Antenna R**



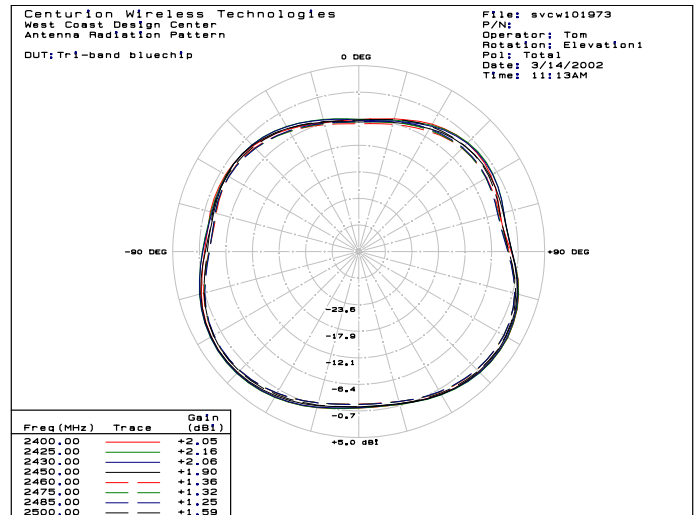
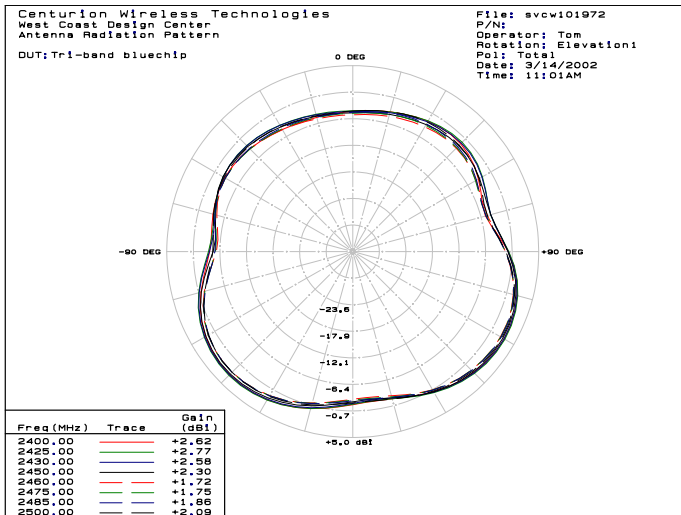
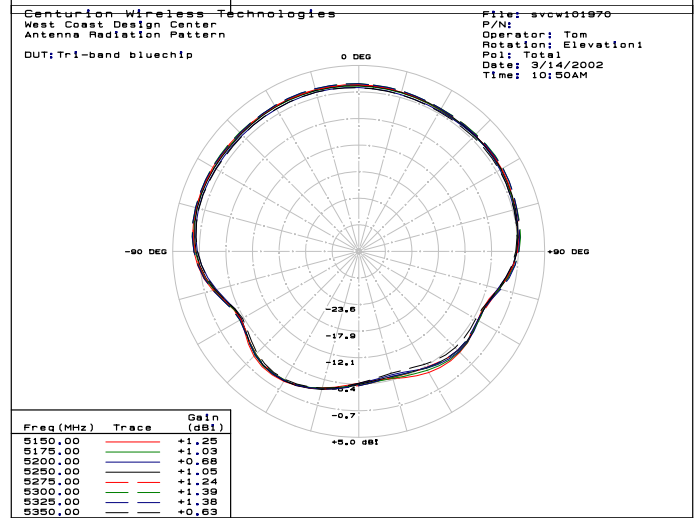
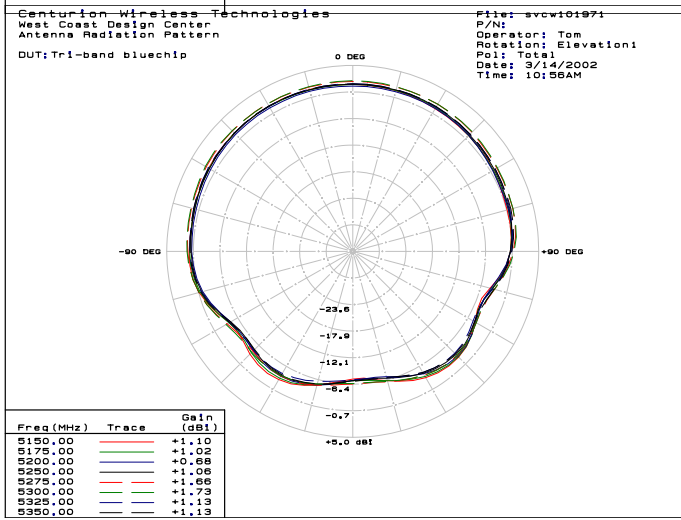
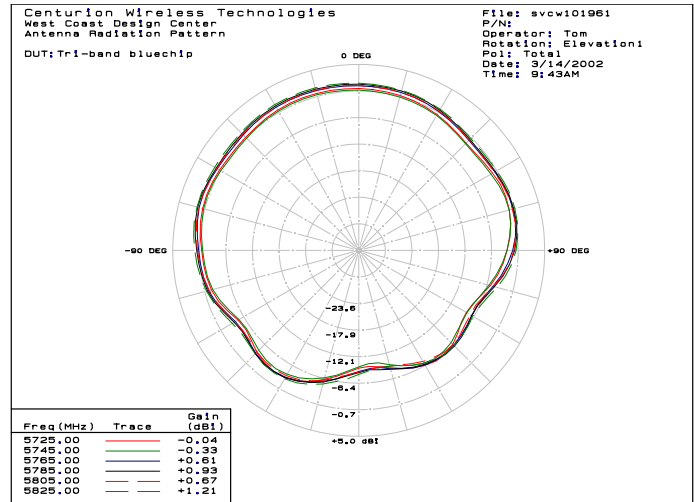


## Elevation Cut Antenna Patterns (Phi=0)

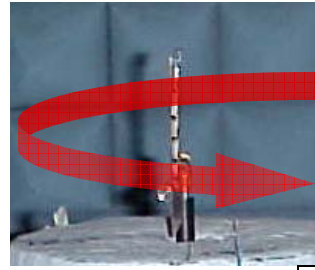
Antenna A



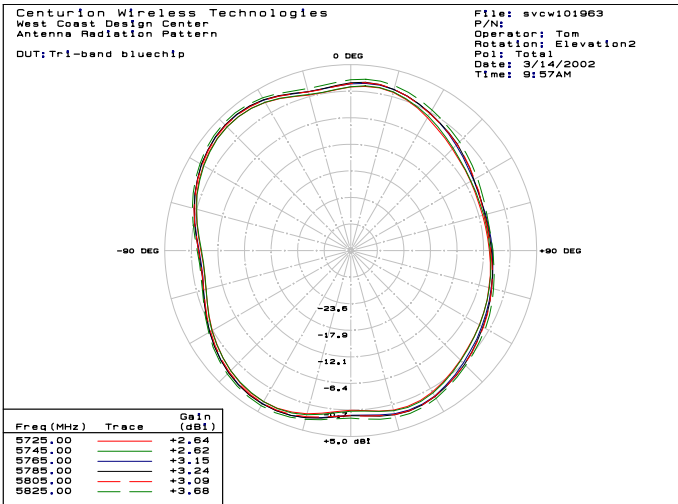
Antenna B



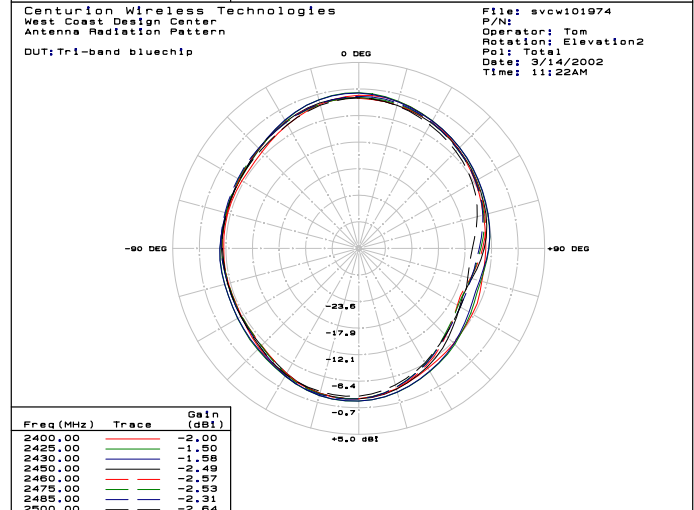
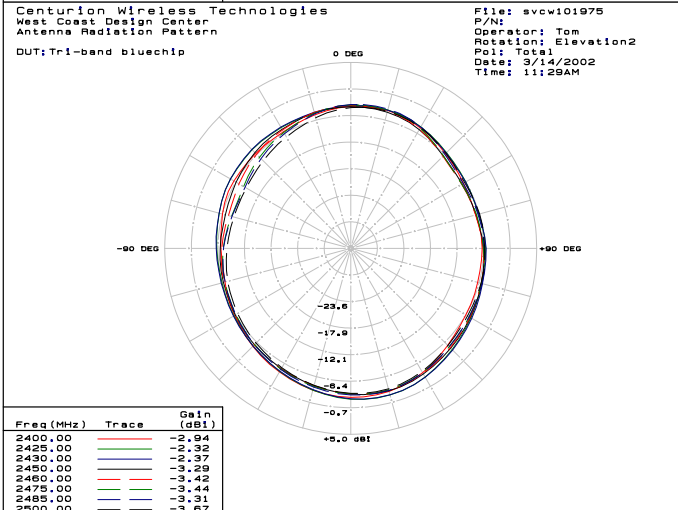
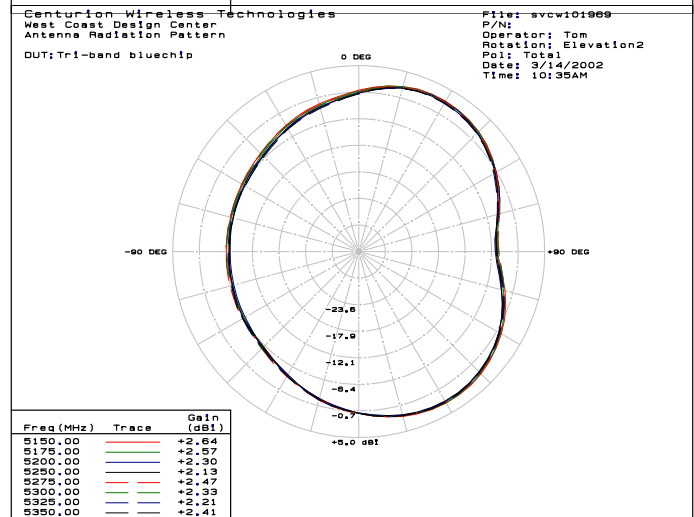
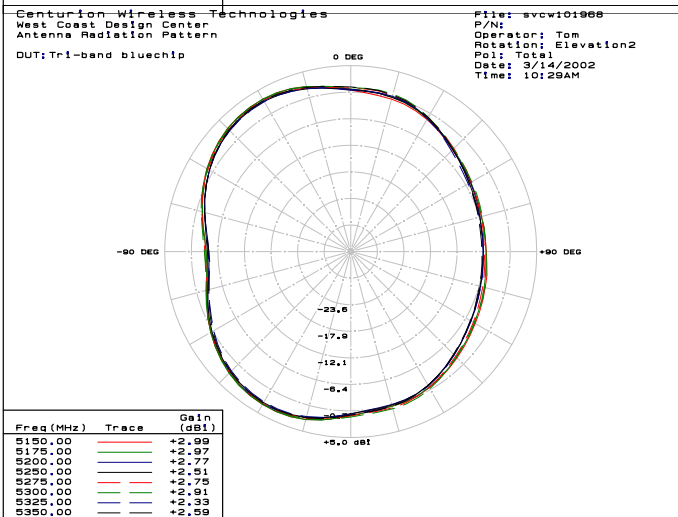
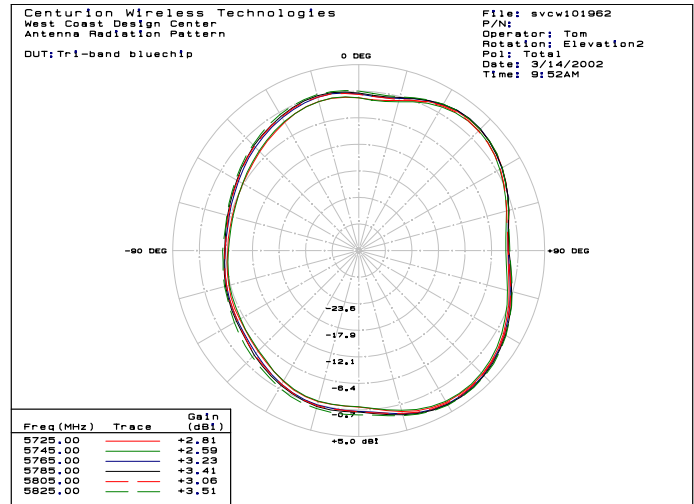
## Elevation Cut Antenna Patterns (Phi=90)



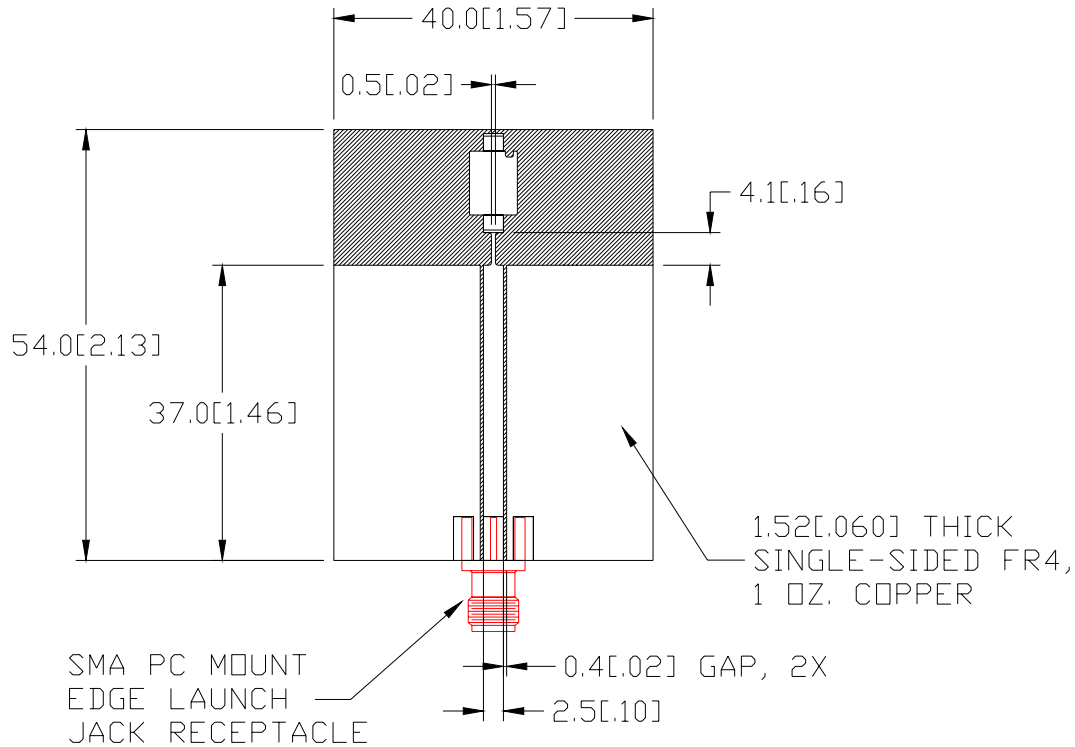
Antenna A



Antenna B



## Evaluation Board Specifications



### Evaluation Board Specifications:

#### PCB Dimensions:

Height: 54 mm

Width: 40 mm

Substrate: FR-4 (1.57mm thick)

#### Laminate:

1 oz. Copper (0.036mm thick)

Shaded area has copper laminate removed

#### Ground Plane

Height: 37 mm

#### Solder Pads:

Size: 2.6mm x 2.2mm

1 – RF feed

2 – Mechanical support (no connection)

#### Coplanar Transmission Line:

Width = 2.5 mm

Gap = 0.4 mm

#### Connector:

PCB edge launch SMA-jack (female) (Reference Johnson Components Connector 142-0701-801)

Specifications subject to change without notice



## Contact Information

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82-2-551-2720 fax