

# **Using EZNEC to Model Antennas**

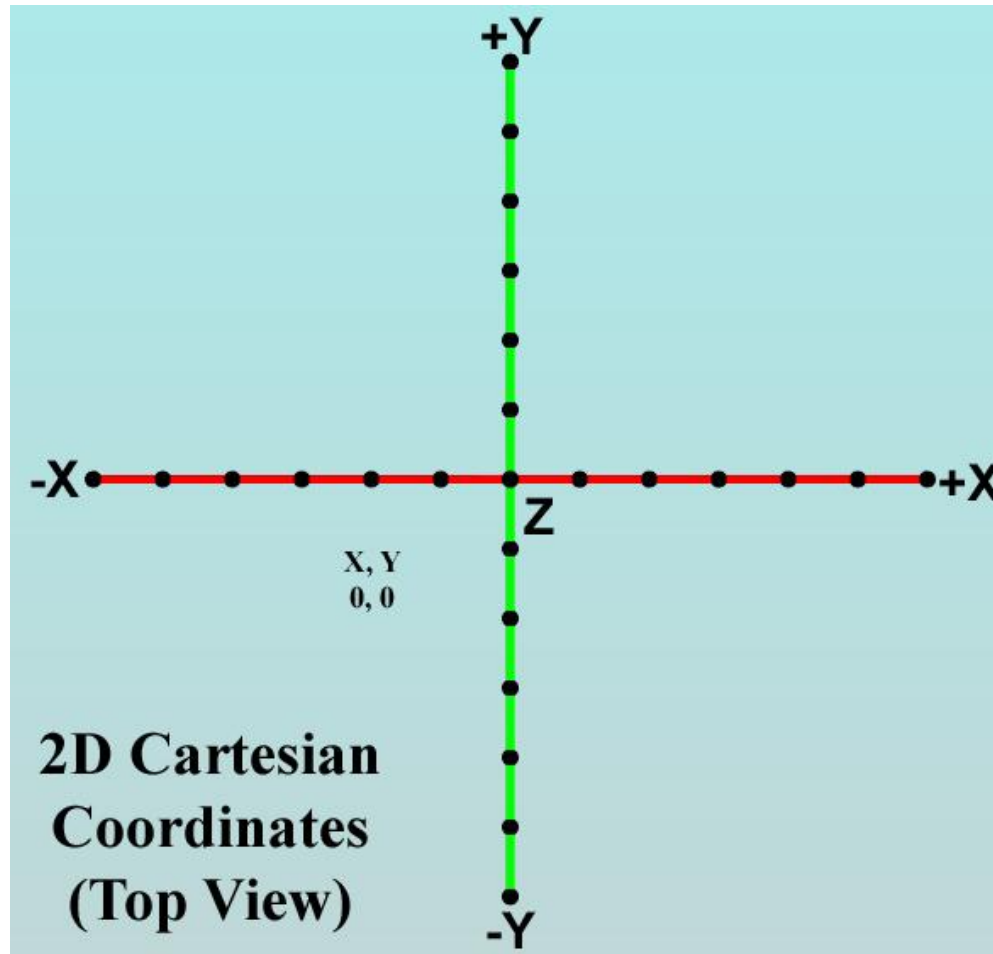
A Hands on Demonstration  
Of the Basic Concepts of  
Using the EZNEC Application

# EZNEC Versions

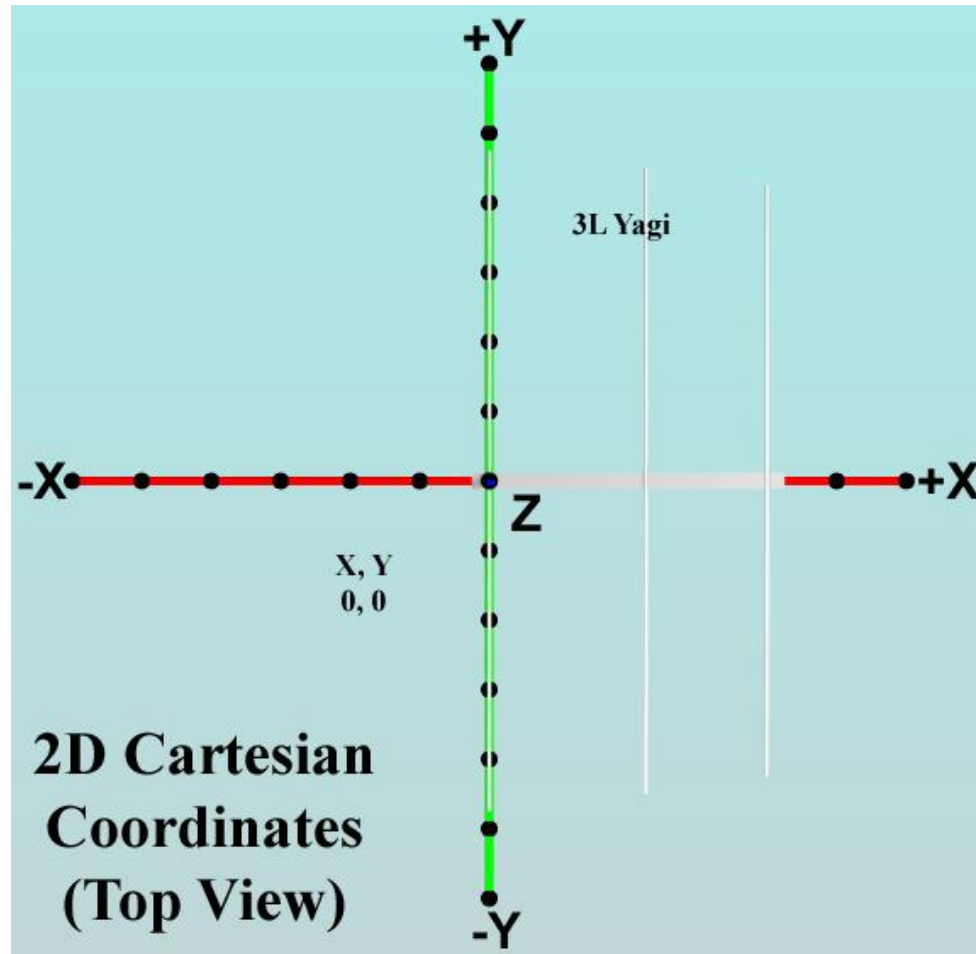
<b>EZNEC versions</b>	<b>Calculating Engine</b>	<b>Segments</b>	<b>Price</b>
<b>EZNEC-ARRL</b>	NEC-2	20	*
<b>EZNEC 5.0 Demo</b>	NEC-2	20	Free
<b>EZNEC 5.0</b>	NEC-2	500	\$89
<b>EZNEC+ 5.0</b>	NEC-2	1500	\$139
<b>EZNEC Pro/2</b>	NEC-2	20,000	\$500
<b>EZNEC Pro/4</b>	NEC-4	20,000	\$650

- EZNEC-ARRL 3.0 is included on the ARRL Antenna Book CD 20th Edition. EZNEC-ARRL 4.0 is included on the ARRL Antenna Book CD 21th Edition. These are equivalent to EZNEC 3.0 Demo and EZNEC 4.0 Demo, except they come with dozens of ARRL designed antenna models.

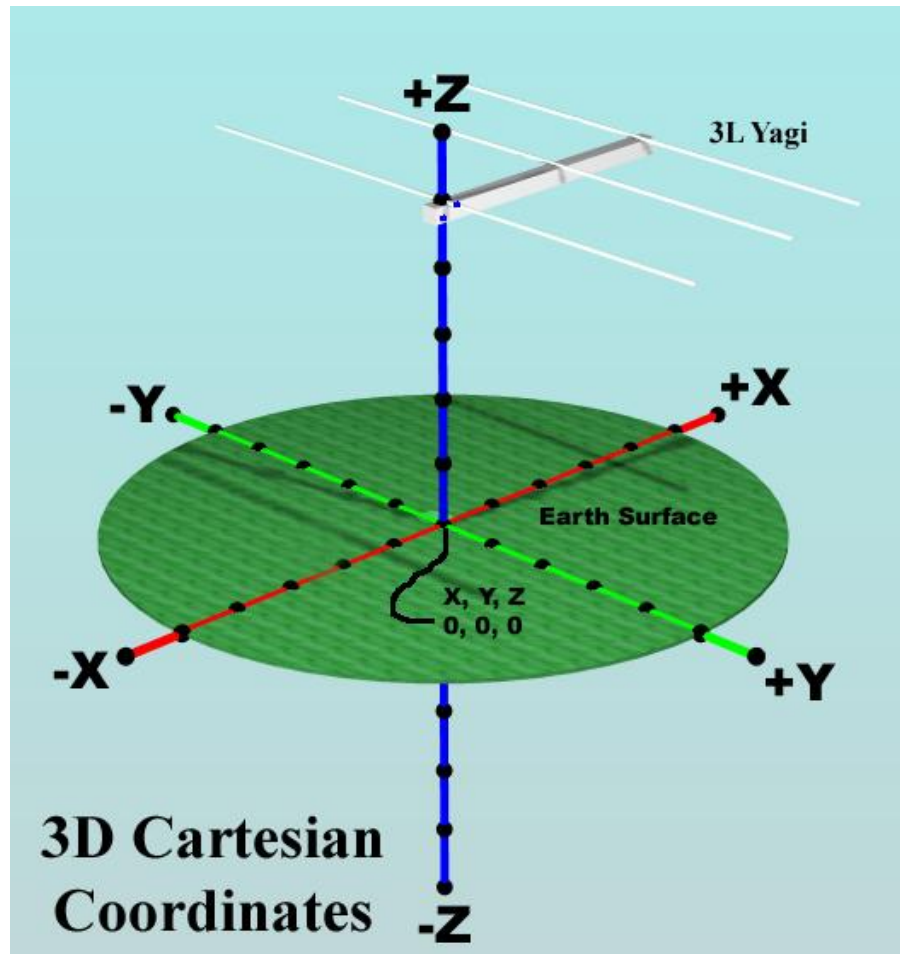
# Cartesian Coordinates in 2D



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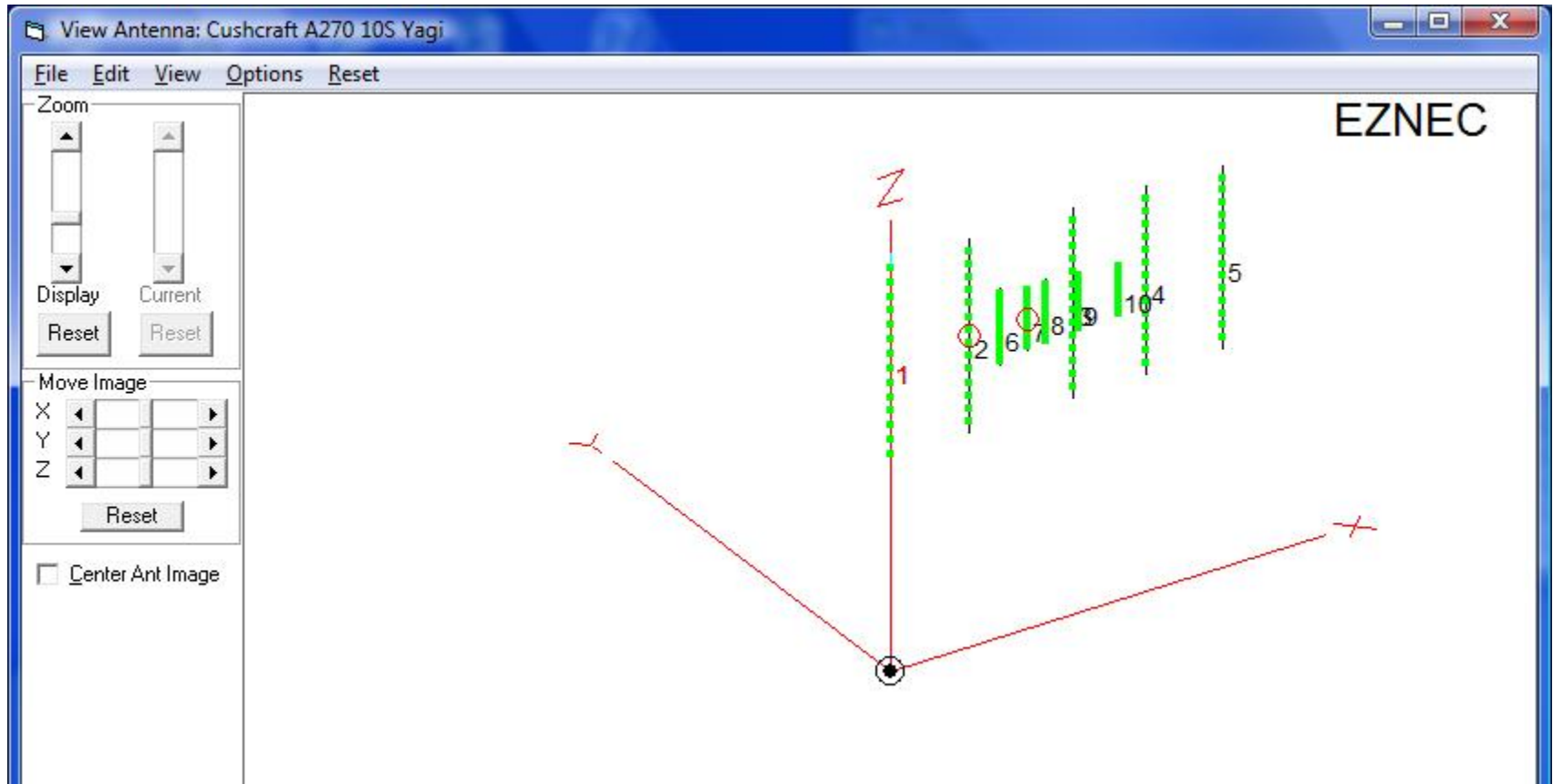


# Cartesian Coordinates in 3D



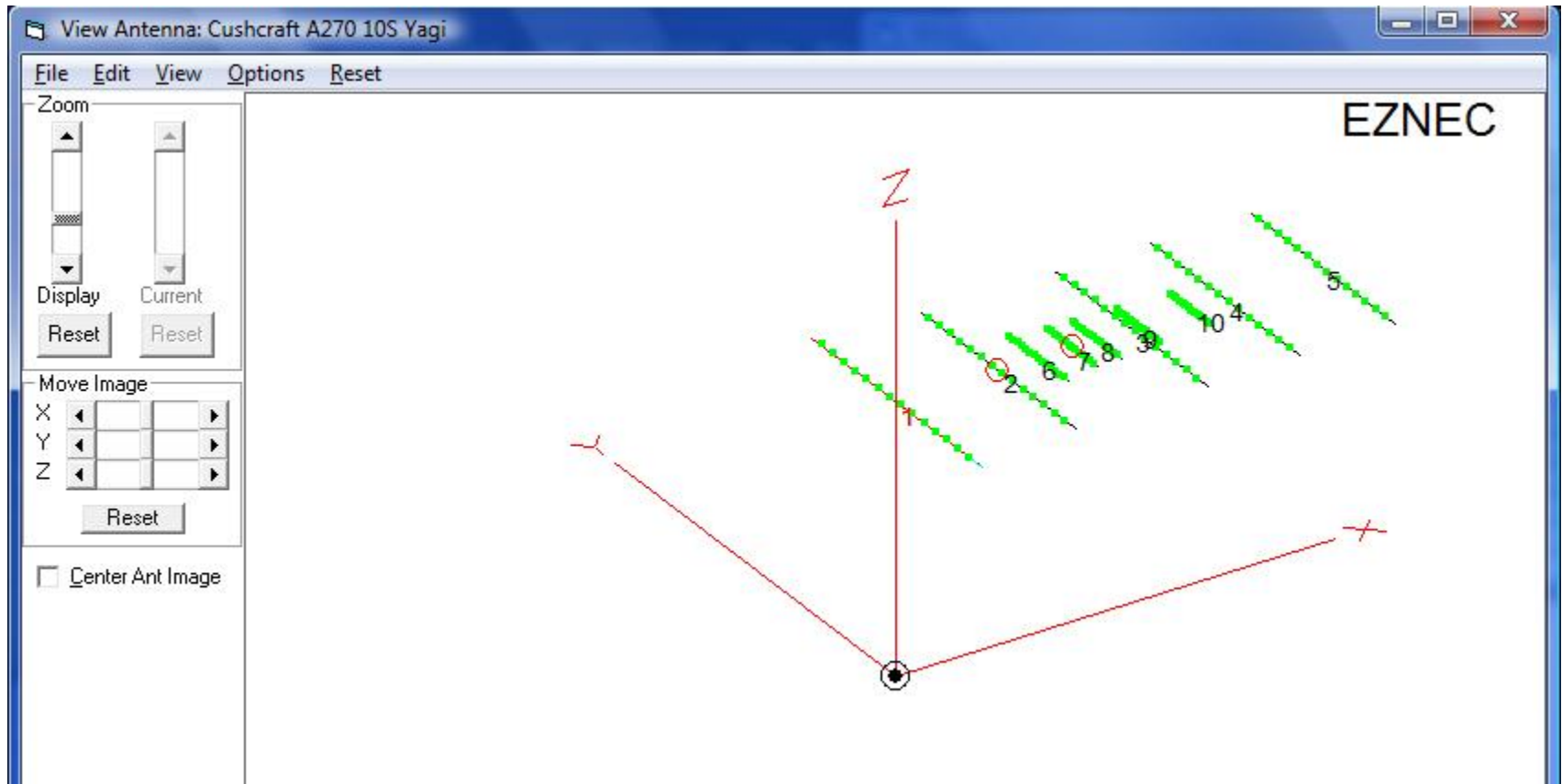
# EZNEC View Antenna Window

## A VHF/UHF Vertical Yagi

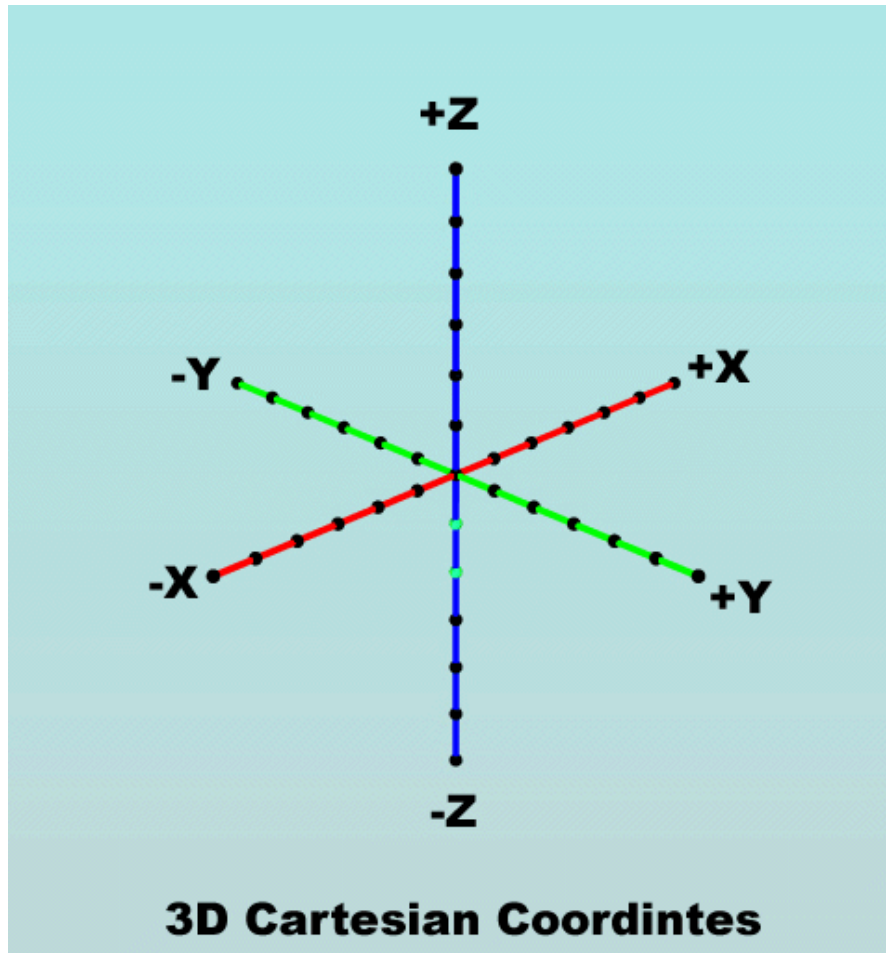


# EZNEC View Antenna Window

## A VHF/UHF Horizontal Yagi

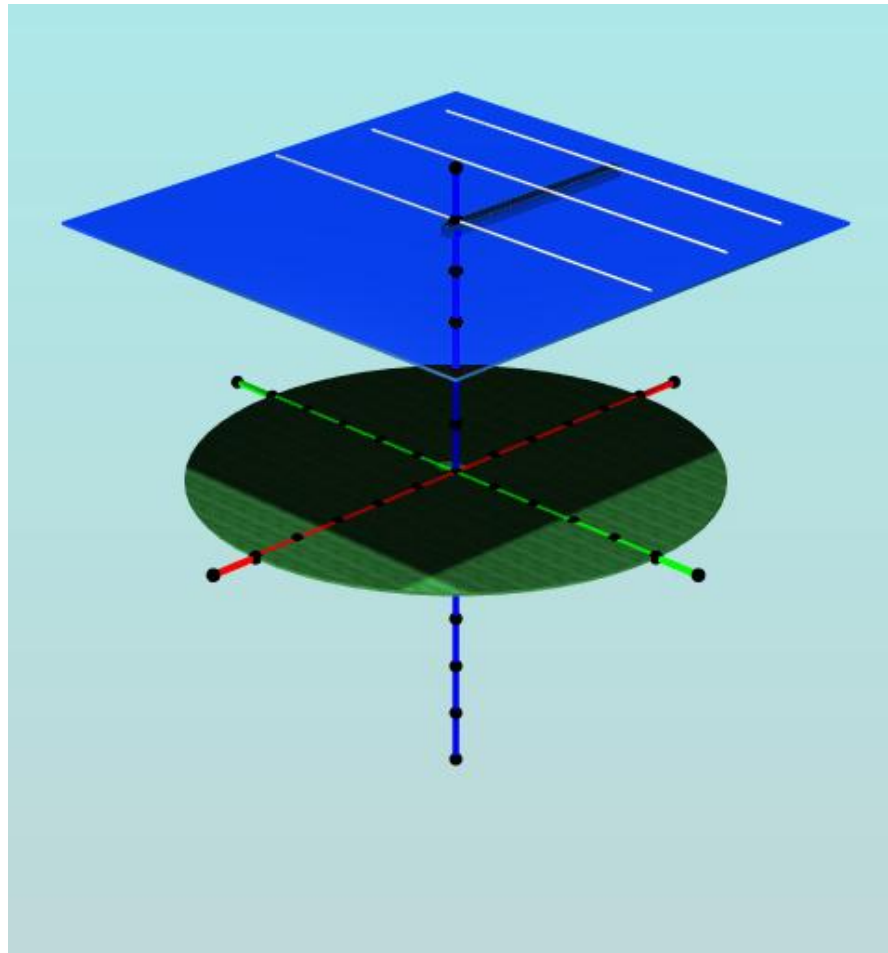


# Cartesian Coordinates in 3D





# Cartesian Coordinates in 3D



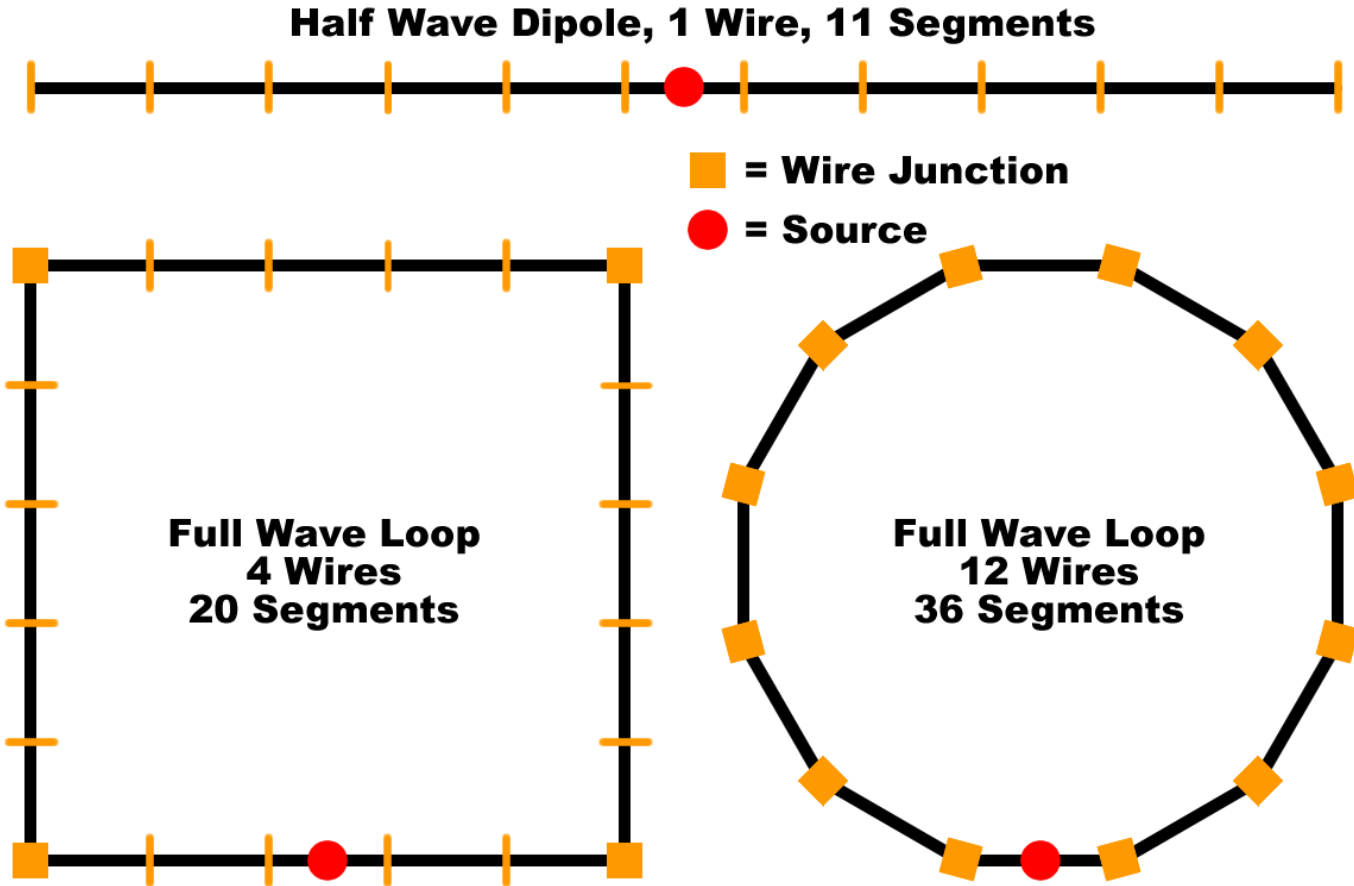
# NEC-based Modeling Terms

**WIRES:** All antenna elements are made up of wires when creating NEC 2 models.

- Each wire is divided into **SEGMENTS** of equal length.
- Each wire is straight, so geometrical shapes like circles need to be made up of multiple wires joined together in an octagon or other multi-sided configurations.
- Wires and elements or NOT the same.

# NEC-based Modeling Terms

## WIRE examples



# NEC-based Modeling Terms

**SEGMENTS:** All wires are made up of segments

- Each **SEGMENT** should be of “near” equal length throughout the antenna
- Use at least 9 **SEGMENTS** per half wavelength and 5 **SEGMENTS** per quarter wavelength
- Normally use an odd number of **SEGMENTS** per wire
- Each **SEGMENT** must be at least 4 times the wire diameter

# Wires Smires

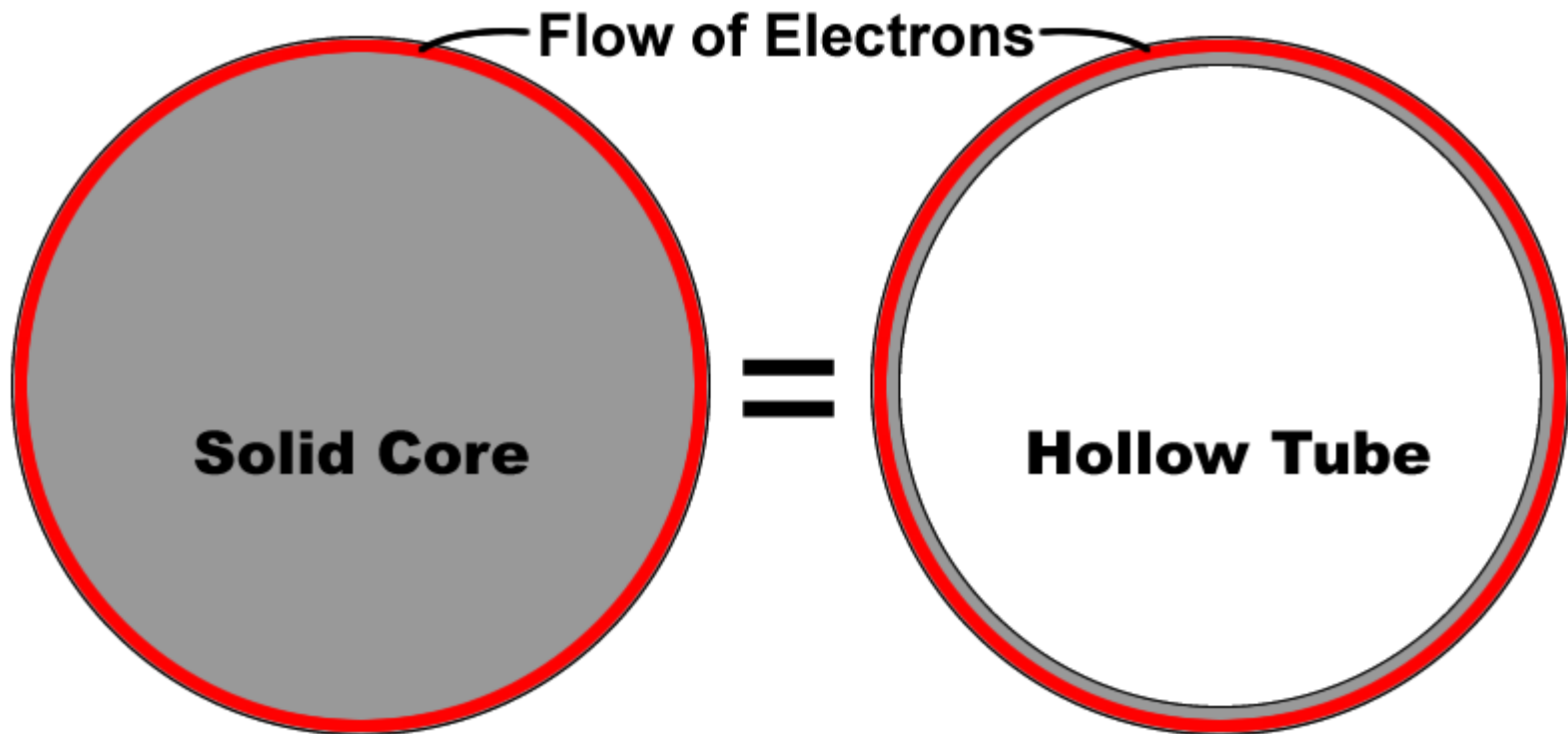
How in the heck can I model a Yagi made of aluminum tubing or a J-pole made of copper piping when I can only model using **WIRES**??

Don't confuse the EZNEC term **WIRES** with electrical wiring. They are *NOT* the same thing.

Do you remember the “*skin effect*”?

# Skin Effect Principle

Briefly stated, current flows near the surface of a conductor, thereby restricting the current to a small part of the total cross-sectional area.



# EZNEC Demonstration

- Create a half-wavelength 20m dipole resonant at 14.250 MHz
- Manipulate dipole in EZNEC to show how to tweak your design and make easy changes and/or data comparisons (a useful tool)
- Add a reflector to dipole to make a 2L yagi
- Add a director to make a 3L yagi

# Wire Adjustment Formula

$$\frac{\textit{Current Resonant Frequency}}{\textit{Target Frequency for Resonance}} \times \textit{Antenna Wire Length}$$

$$\frac{13.9 \textit{ MHz}}{14.25 \textit{ MHz}} \times 0.25 \lambda = 0.24386$$