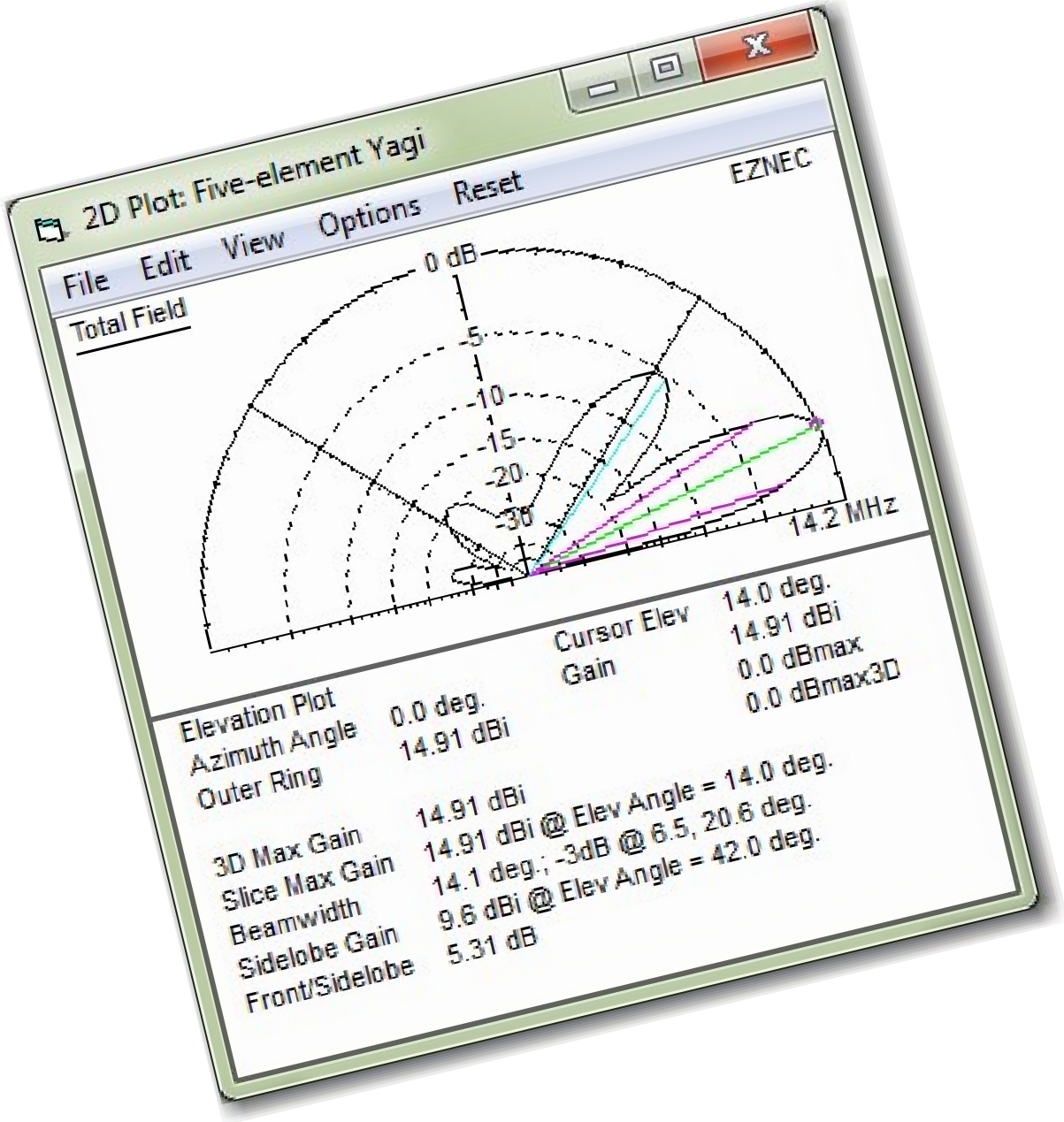


Intro to EZNEC

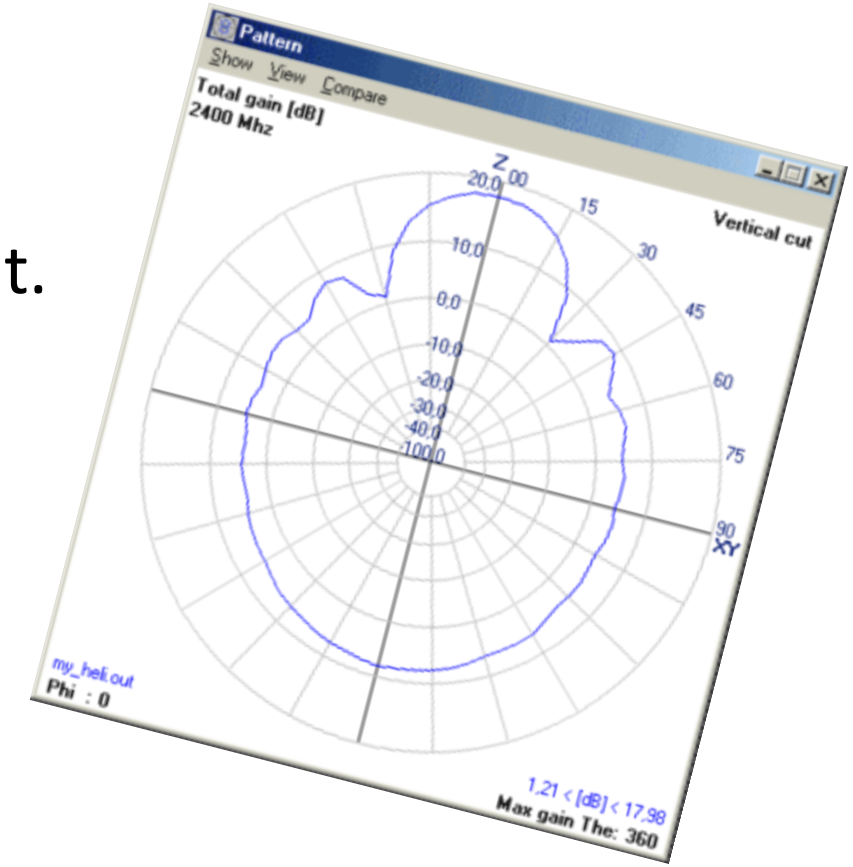
Wesley Cardone, N8QM

February 2024

Presented to the Chelsea Amateur Radio Club

What is EZNEC

- It’s rocket science
  - Originally written in Fortran
  - Lawrence Livermore National Laboratory in 1970s
- You don’t need to be a rocket scientist to use it.
- You need:
  - To be readily aware of is terminology
  - Nomenclature
  - Methods of opening dialog boxes



Why Have an Intro?

- The EZNEC help file is magnificent in its introduction to the software.
- Yet, the average amateur radio operator needs a kick-start to get going.

What Presented

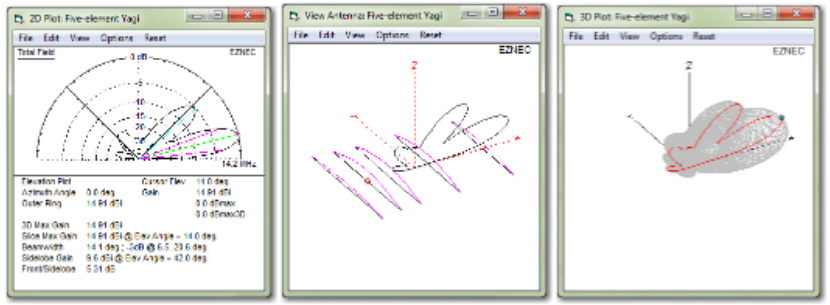
- The GUI
  - Dialog Boxes named and identified
- A stick-representation of an antenna
- Stimulus
- Radiation Pattern
- Next Steps

Getting Started

Chart Trainin... | EMI - IS 200.C | Tank Volume Calcul... | Se

Antenna Software by W7EL

FREE - EZNEC Pro+ v. 7.0 is now available! - FREE



Above: Screen shots from several ***EZNEC*** displays. **Right:** 3D far field pattern, with 2D elevation "slice" highlighted. Any azimuth or elevation slice can be highlighted. **Center:** View Antenna display, showing the "wires" making up the model of the fi
Several other items, such as currents and wire numbers, can be added to this display. **Left:** 2D display showing detailed information about the selected slice.

What's New in v. 7.0

All features which were available in ***EZNEC Pro/2*** v. 6.0 are incorporated into ***EZNEC Pro/2+*** v. 7.0 with a few exceptions described below. ***EZNEC Pro/4*** v. 6.0 was identical to ***EZNEC Pro/2*** except for the inclusion of an internal NEC-4.2 calculating

- External calculating engines - Both ***EZNEC Pro/2+*** and ***EZNEC Pro/4+*** can use external NEC-4.2 and NEC-5 programs for calculations. After installing ***EZNEC Pro/2+*** or ***EZNEC Pro/4+***, open the manual (Help/Contents) then open the Refer these and how to get them.
- Individual wire loss - Each wire can have different loss if desired.
- Improved NEC format file reading - A number of deficiencies were addressed and corrected.
- Plot display enhancements - Line widths and object sizes can be changed in the 2D, 3D, SWR, and View Antenna displays.
- Charge density table - New Options menu selection to optionally add charge density data to the Currents table.
- Example files and Test Drive updates - Example files have been updated to replace MININEC type ground with Real, High Accuracy ground where MININEC ground isn't needed. The Test Drive tutorial has been updated calculating engine. Original versions of example files which were changed are in a Legacy subdirectory.
- Undo Calculating Engine Change - Certain features are automatically enabled or disabled, and items such as a second ground medium can be deleted when changing calculating engines. So calculation engine changes
- Wire Segment Intersection Conversion - Descriptions containing wires intersecting at segment junctions can automatically be converted to the now-required wire end connections.

Click here to see deleted features and other changes.

Download EZNEC Pro/2+ v. 7.0

Highly recommended! NEC-5
-- New v. x13 available(*)

Highly recommended! AutoEZ

EZNEC Pro/4 users click here for a free upgrade to EZNEC Pro/4+

(*) See 'NEC-5 engine second revision now available' by AC6LA for information about NEC-5 modified version x13

Google

eznec download

Google Search | I'm Feeling Lucky

Videos | Free | Images | Shopping | Persp

About 28,600 results (0.25 seconds)

EZNEC Antenna Software by W7EL
https://www.eznec.com

EZNEC Antenna Software by W7EL
REE - **EZNEC** Pro+ v. 7.0 is now available! - FREE ... Abo
EZNEC displays. Right: 3D far field pattern, with 2D elevatio

EZNEC v. 6.0 Maintenance ...
EZNEC v. 6.0 Maintenance Updates. EZNEC Pro/2+ v. 7

Printable manual for EZNEC ...
The EZNEC Pro+ v. 7.0 manual is in the form of a help fi

Here
So don't delay if you want the upgrade, and be sure to m

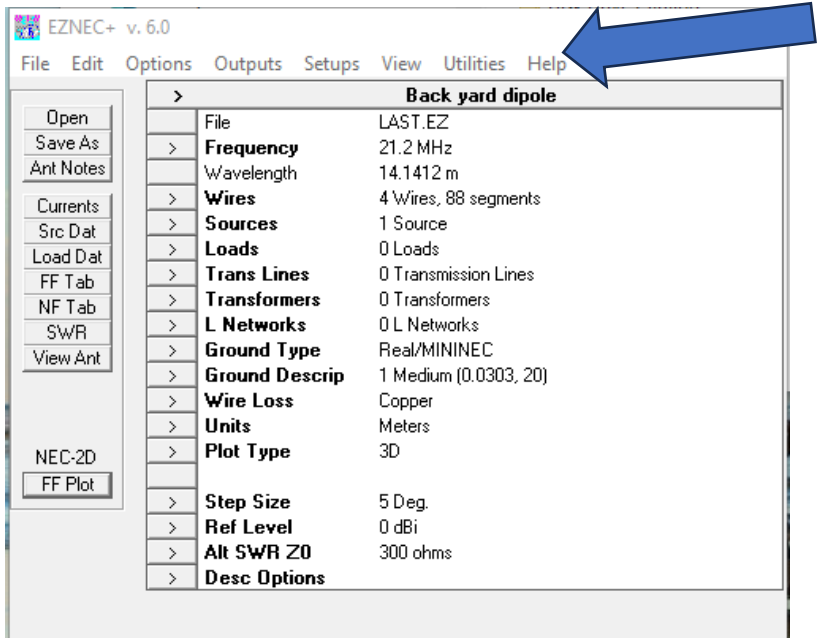
NEC-5
NEC-5 · Allows buried conductors · Not subject to steppe

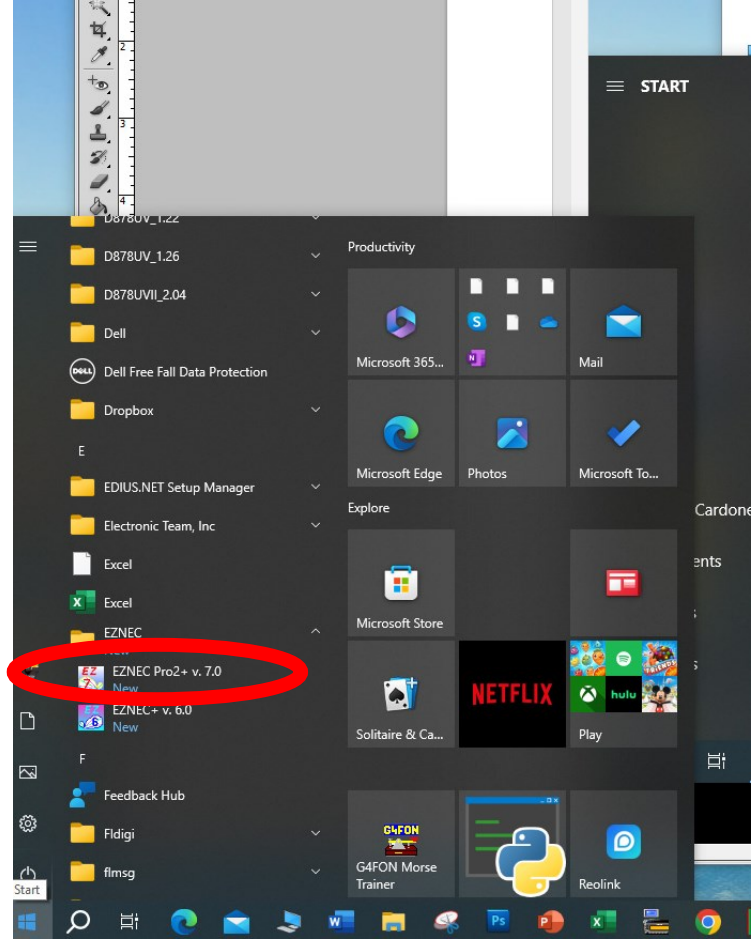
More results from eznec.com »

Informer Technologies

Now, Learn the Terminology

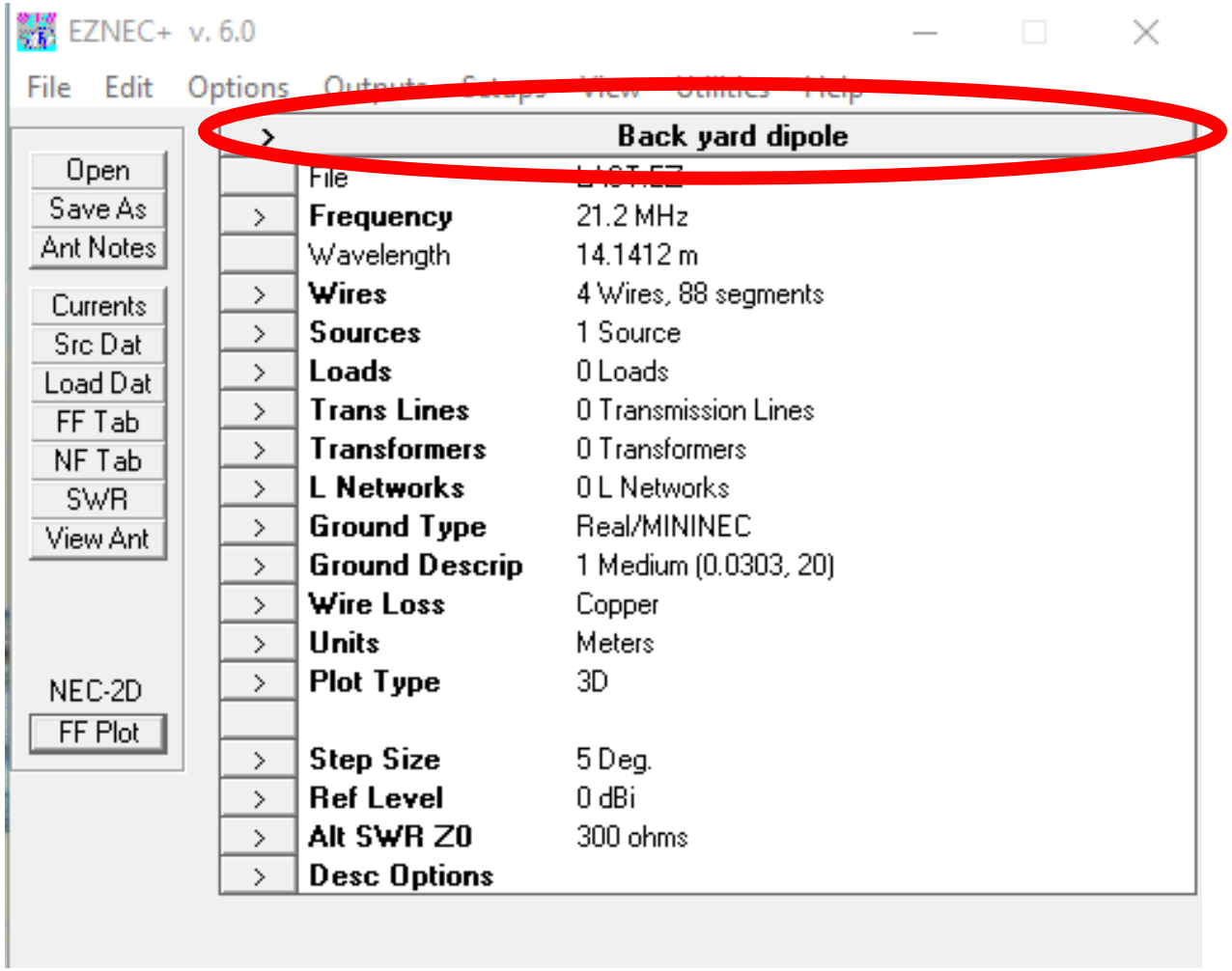
- The “Control Center”
  - Upon invocation, the Control Center appears.
- The help screens pretty much assume that you, as the viewer, recognize this nomenclature.
- You need to learn to recognize these names.





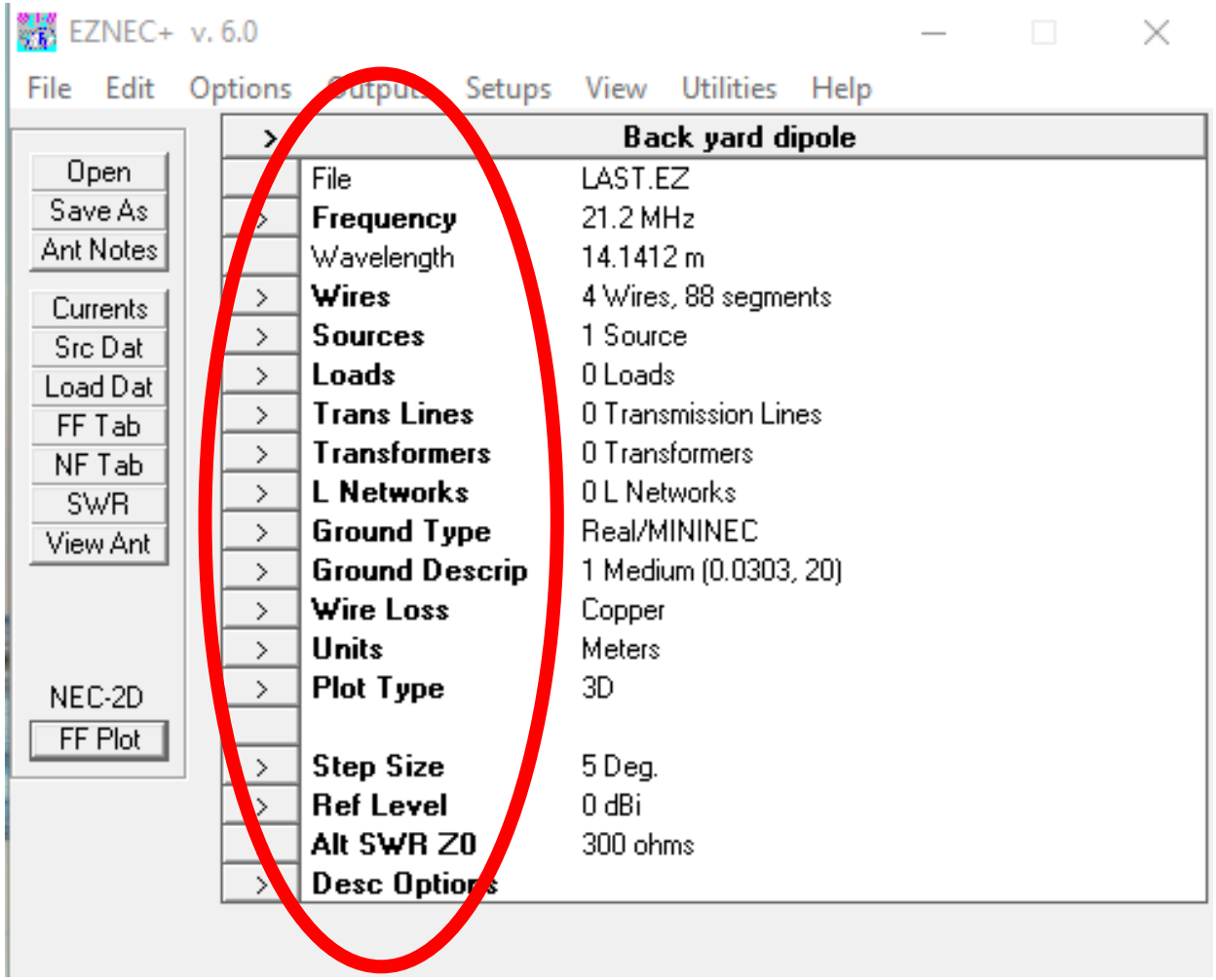
Information Window Title Bar

- There exist “information windows.”
  - The banner of the control center is called the “Title Bar.”



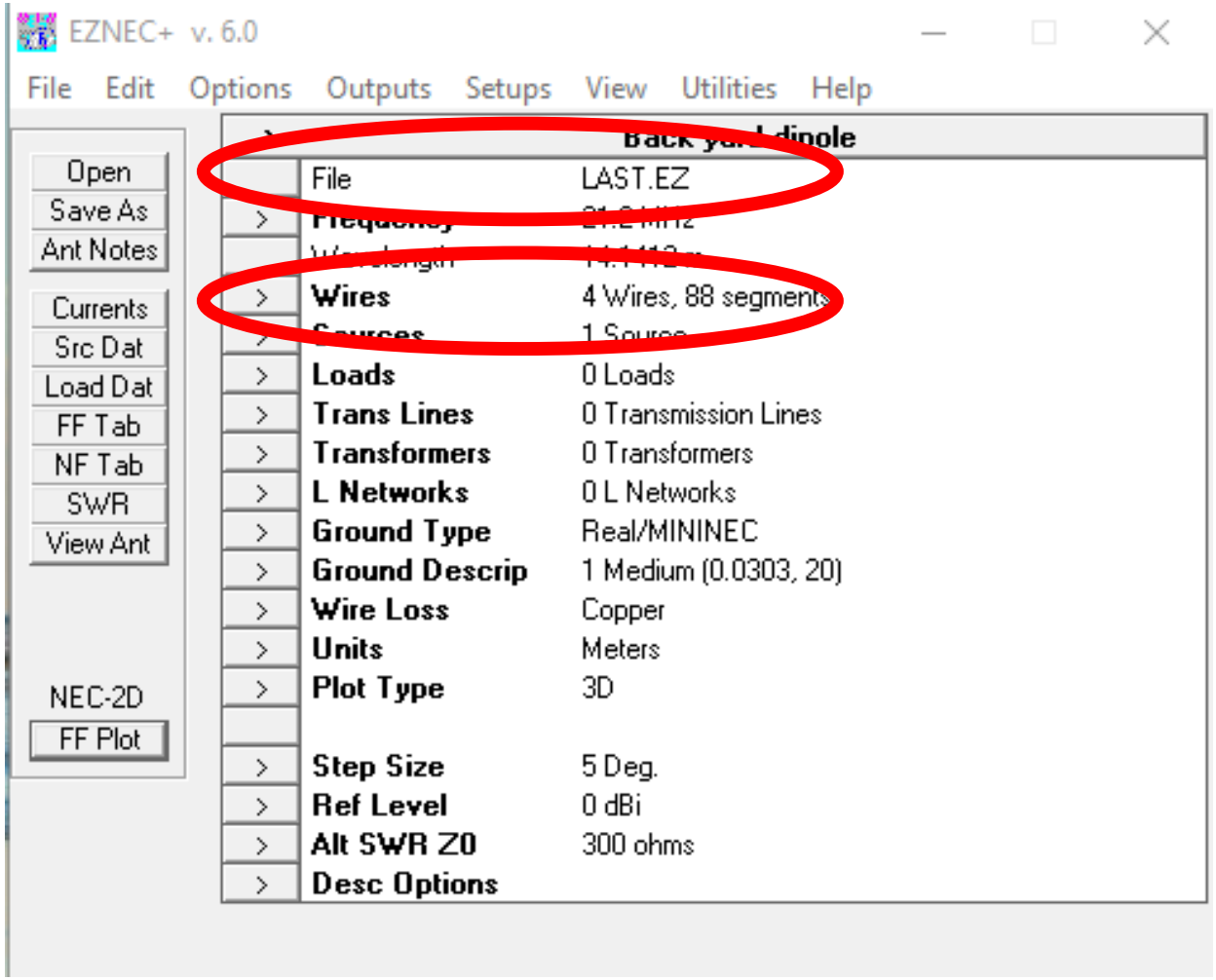
Information Windows

- There exist “information windows.”
  - The banner of the control center is called the “Title Bar.”
  - There exist a variety of other information windows.



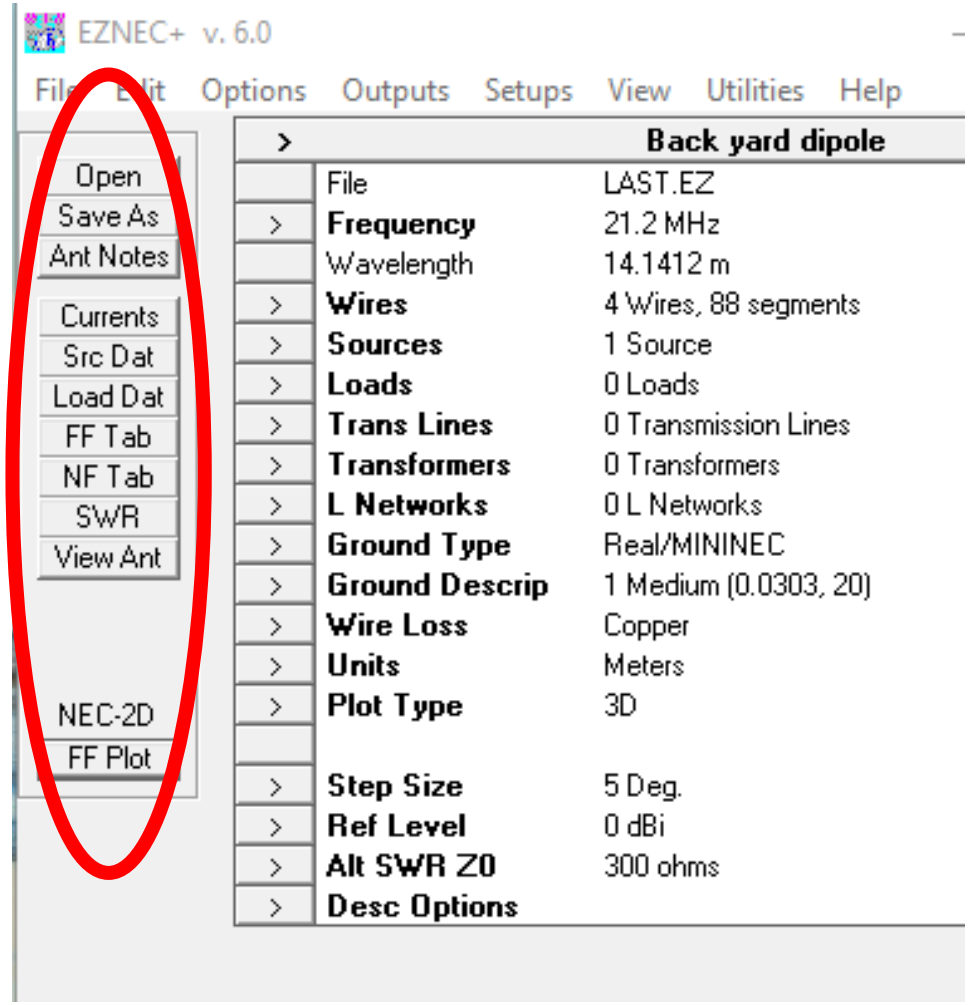
Info Windows—Openable and Informational

- There exist “information windows.”
  - The banner of the control center is called the “Title Bar.”
  - There exist a variety of other information windows.
    - Those with “>” sign produce dialog boxes.
    - Those without “>” sign are only for informational purposes.



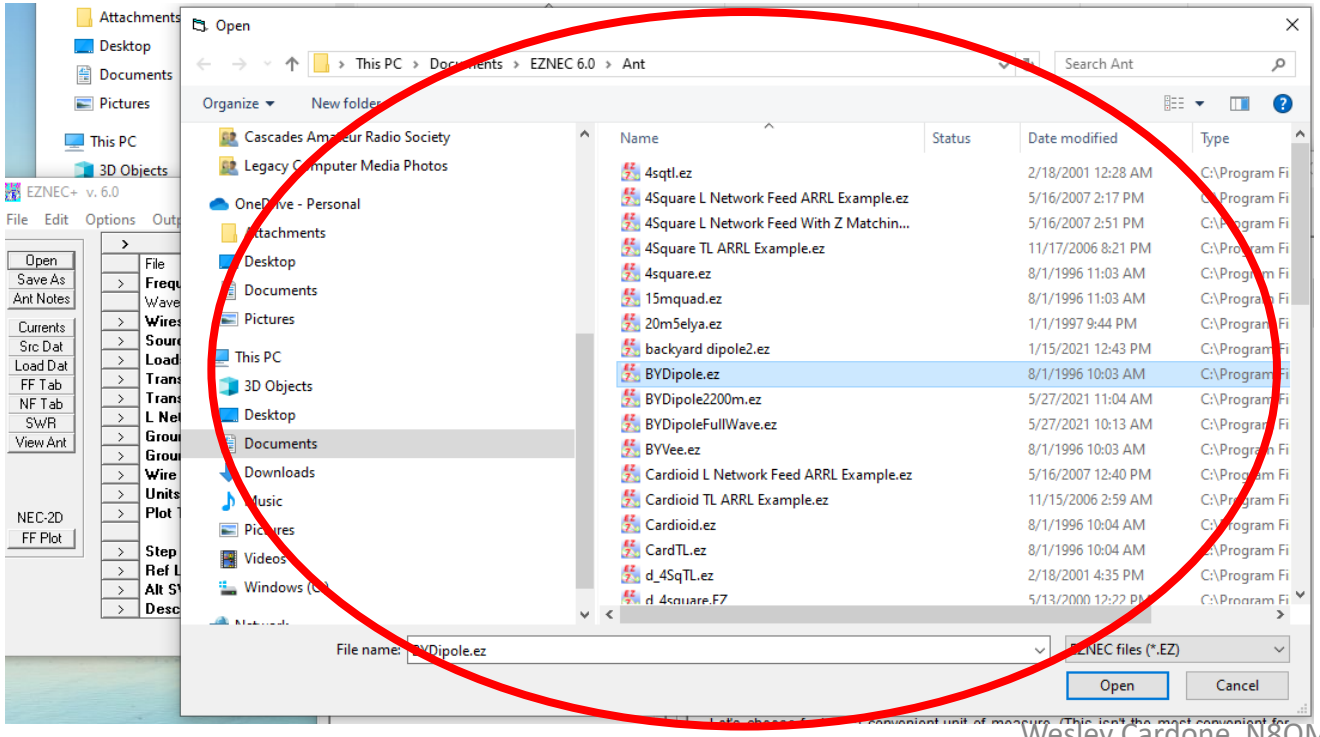
Action Buttons

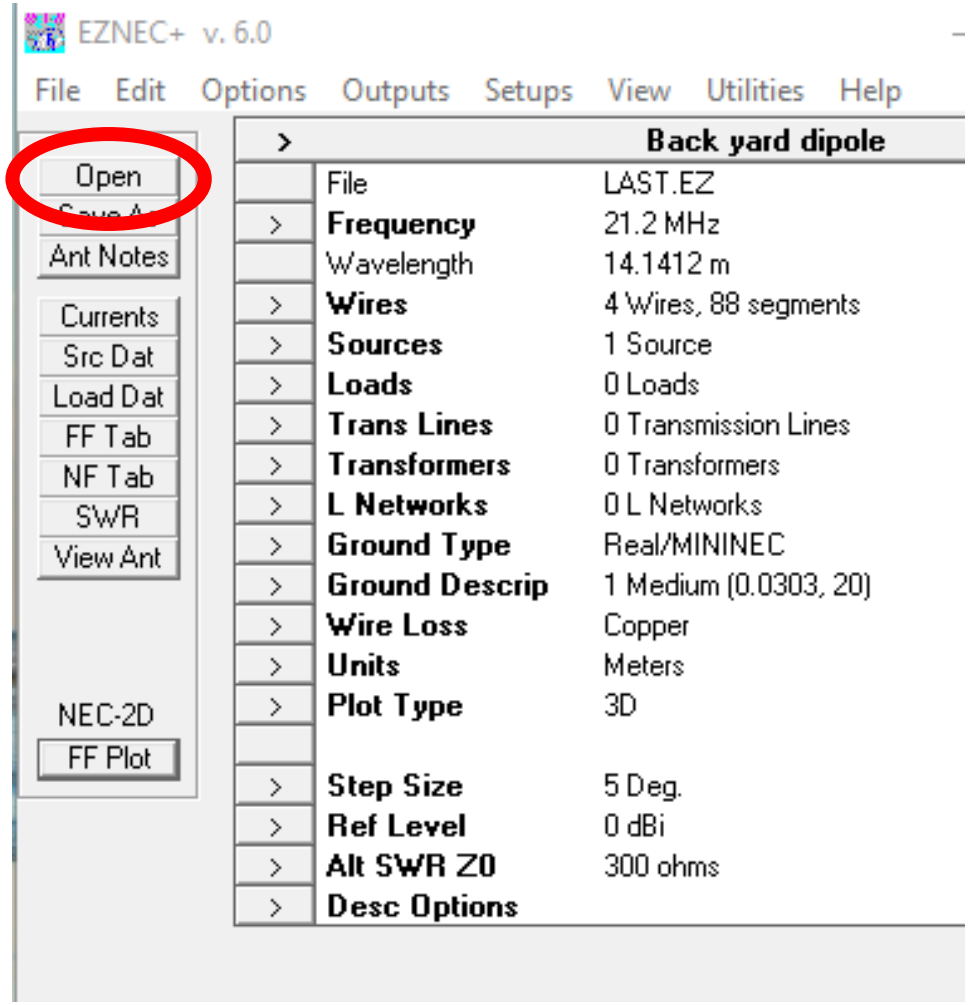
- Action Buttons provoke actions.



Action Buttons

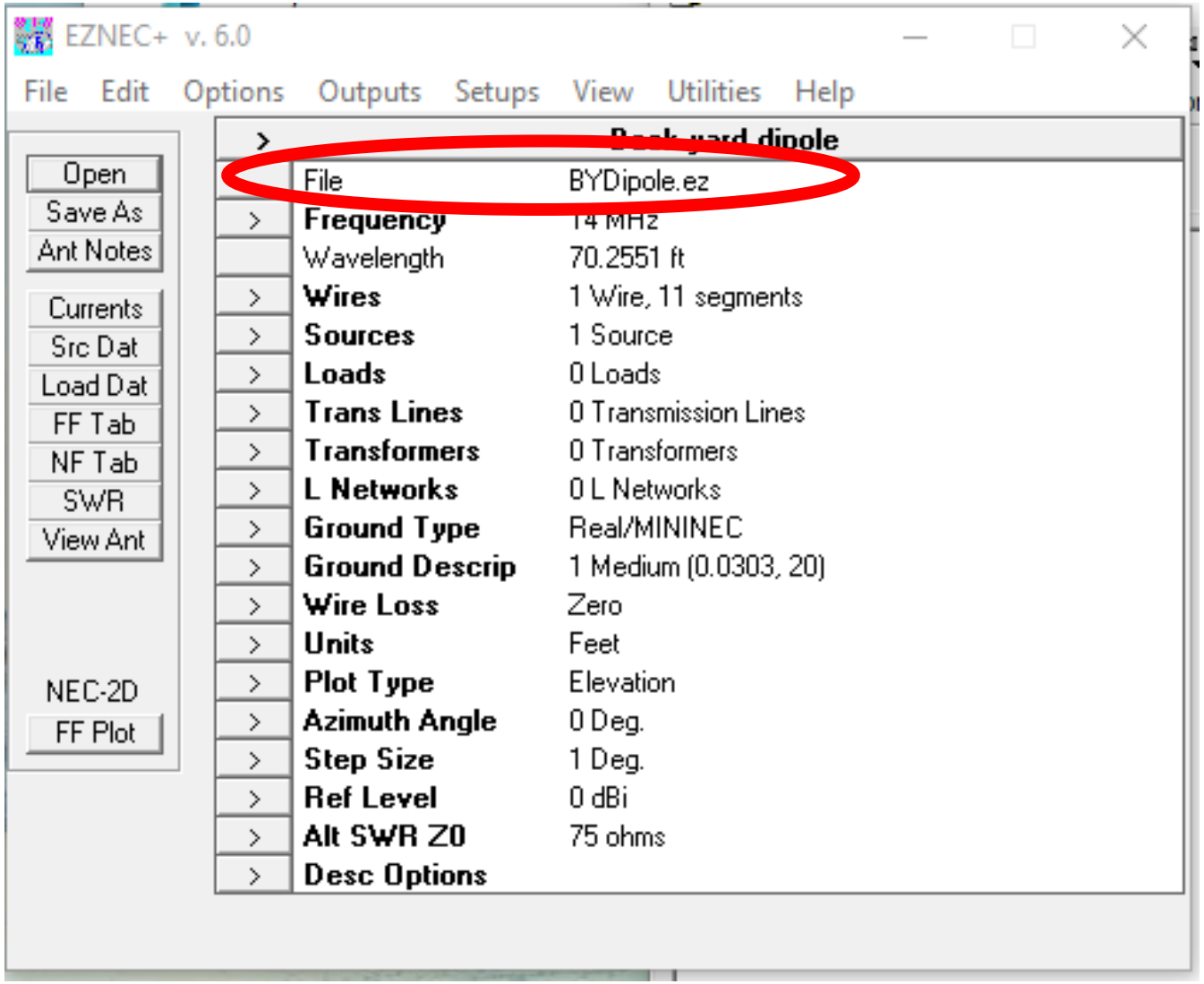
- Action Buttons provoke actions.
  - “Open” button produces dialog box asking for a file to open.





Action Buttons

- Action Buttons provoke actions.
  - “Open” button produces dialog box asking for a file to open.
  - Once opened, file name appears in the file information window.



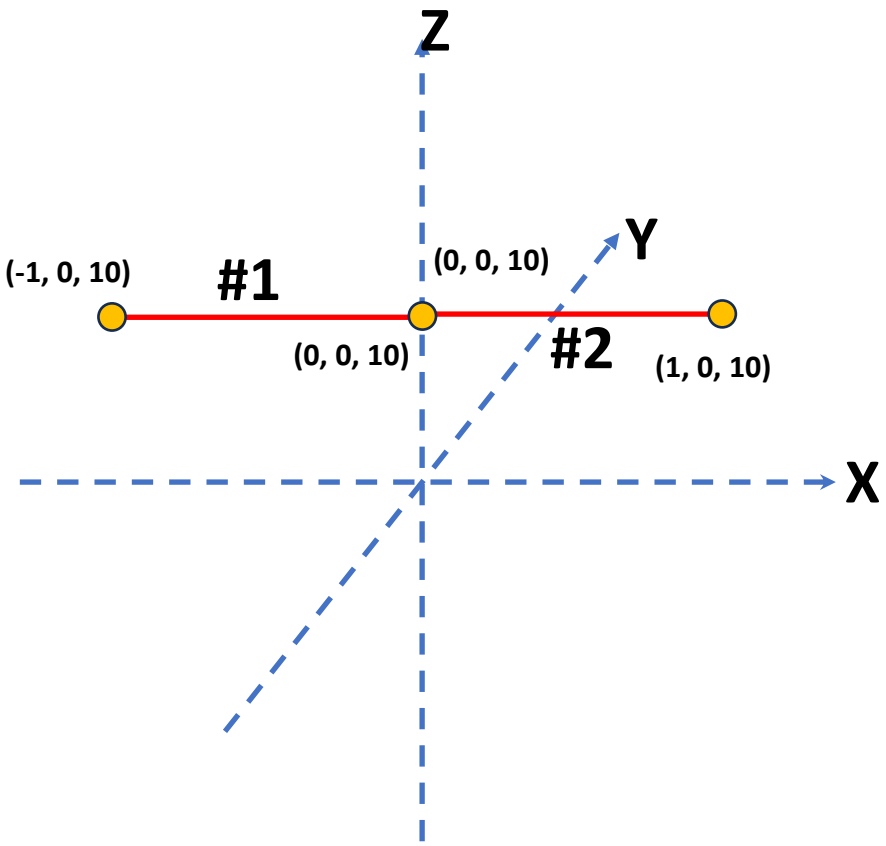
Easiest Way to Depict and Define an Antenna?

- If you had to pick a way that you would like to use to define an antenna architecture… What would you use?

Easiest Way to Depict and Define an Antenna?

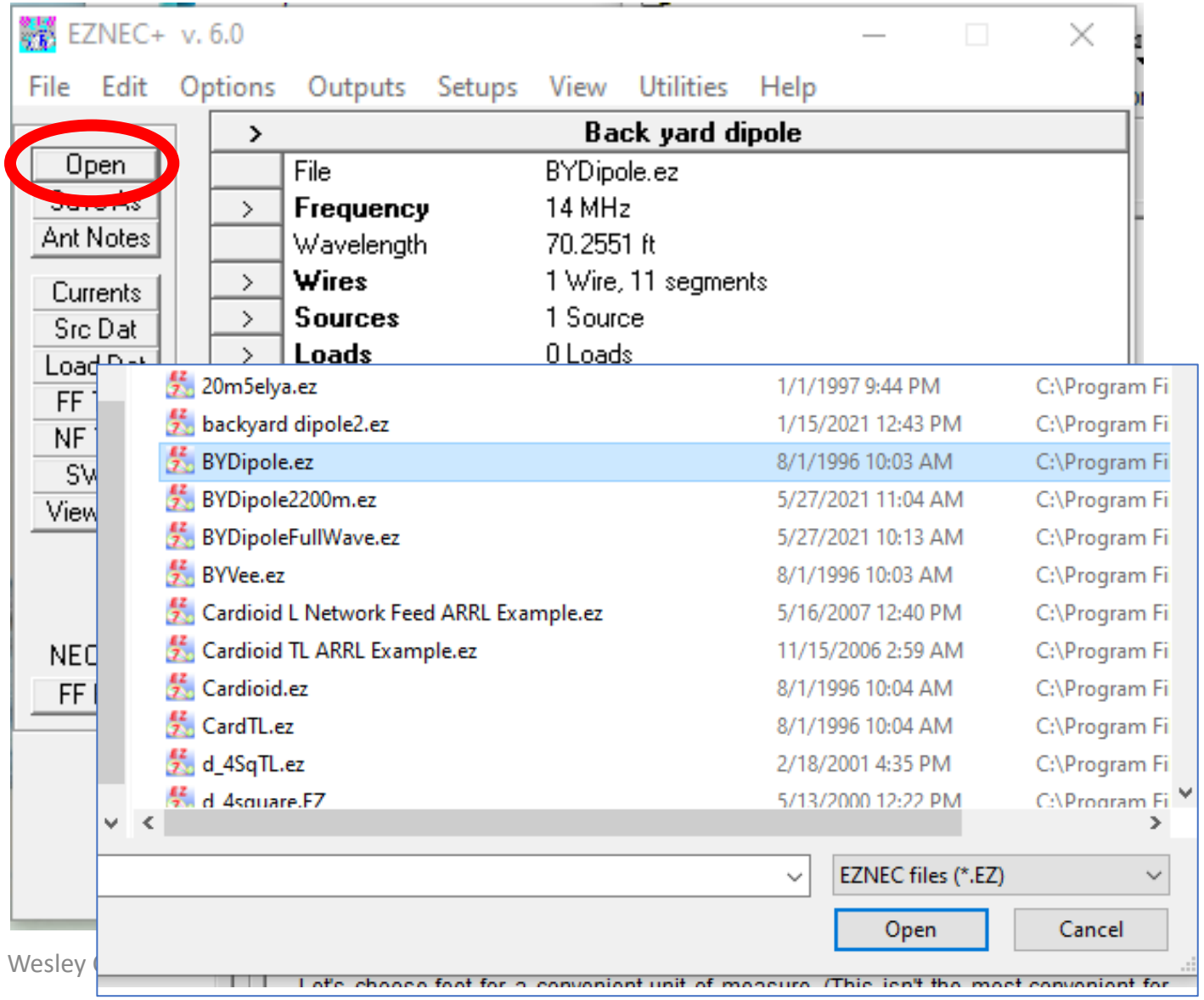
- If you had to pick a way that you would like to use to define an antenna architecture… What would you use?
- Why not use a stick-figure.

Wire	X	Y	Z	Length (m)	Height above Ground (m)
1	-1	0	10	1	10
2	1	0	10	1	10



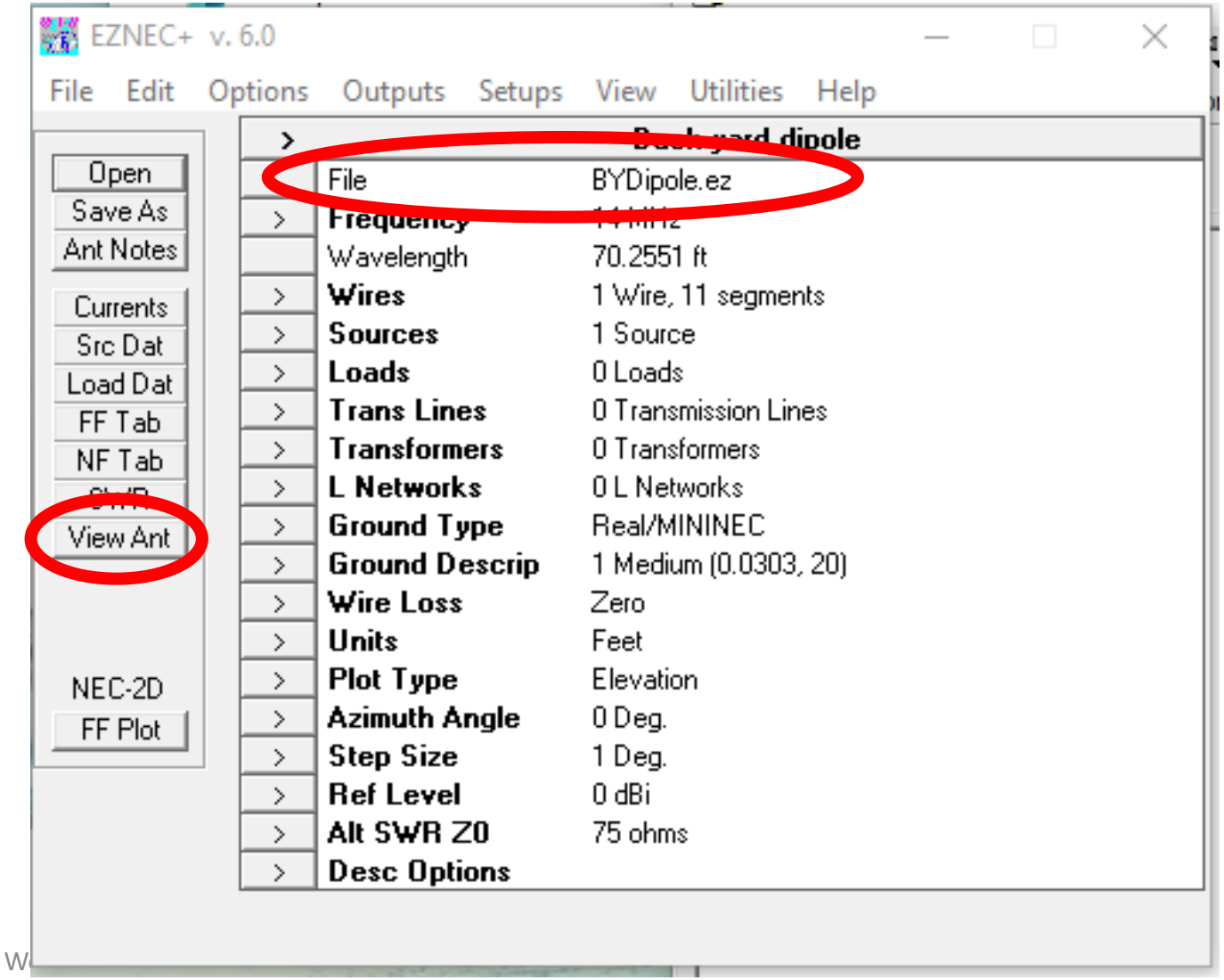
Open BYDipole.ez

- Click the “Open” action button.
- Navigate to BYDipole.ez
- Click Open.



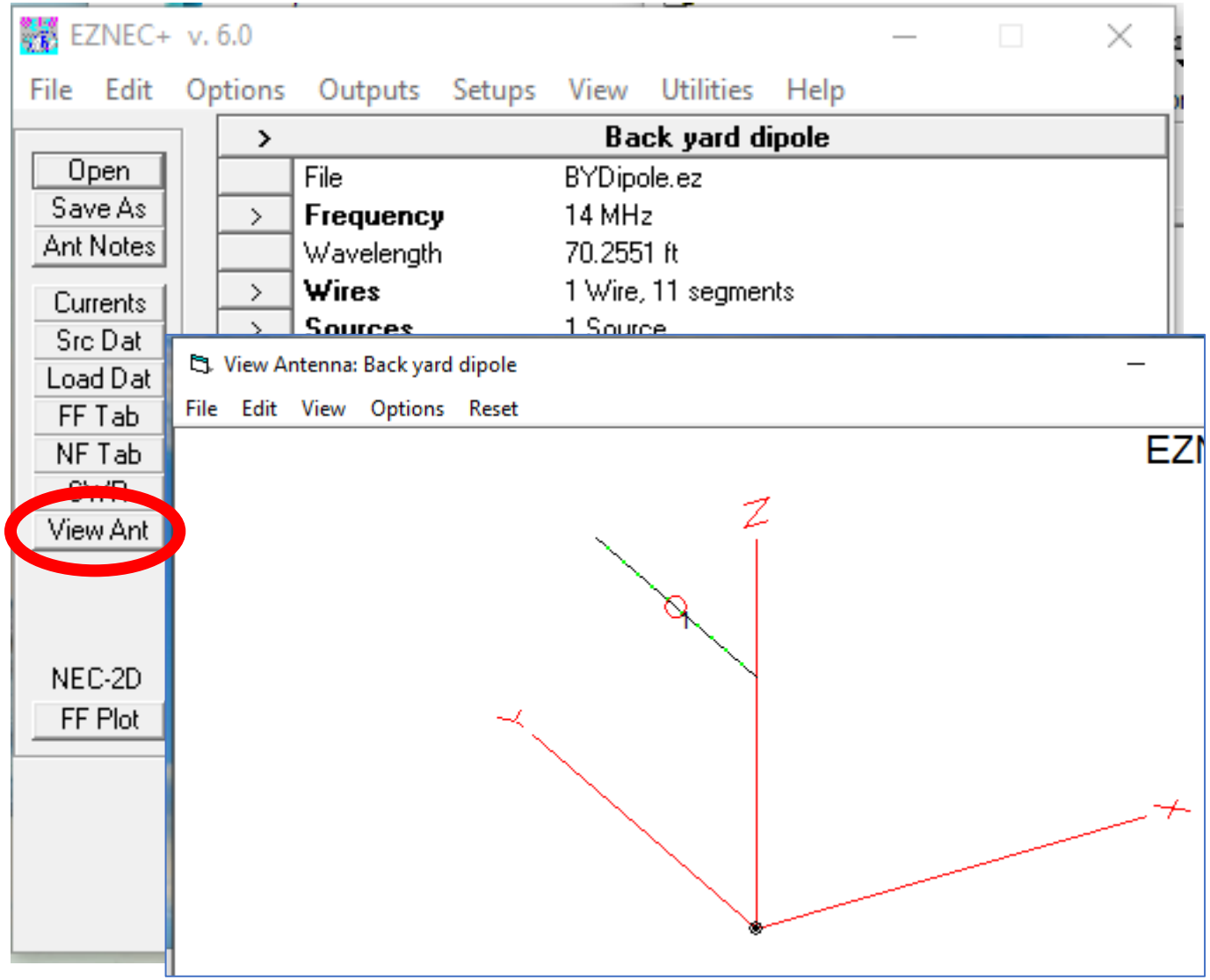
Info Window Reflects Opened File

- The information window "File" confirms that the antenna has been loaded.
- Click the action button "View Ant."



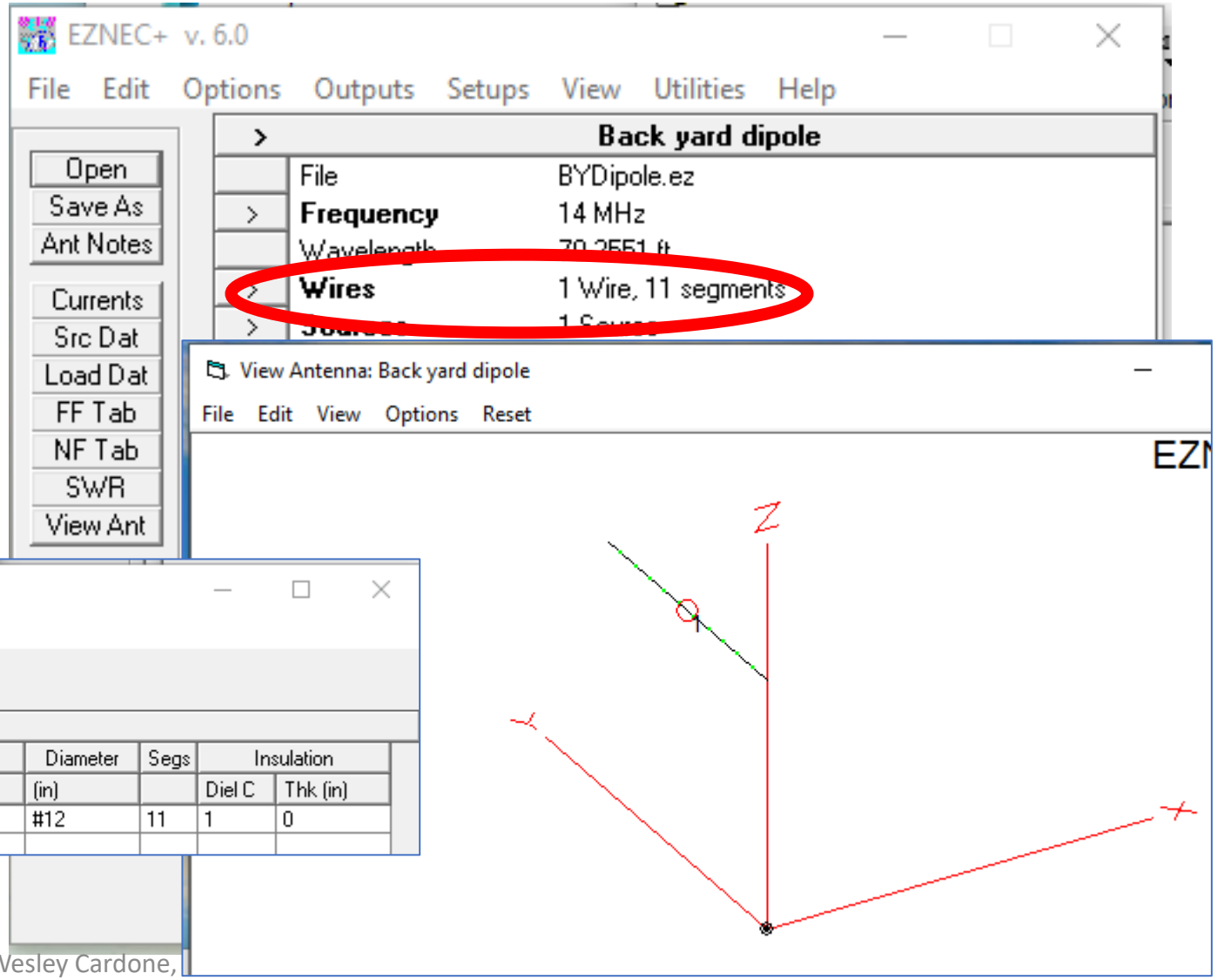
Open BYDipole.ez

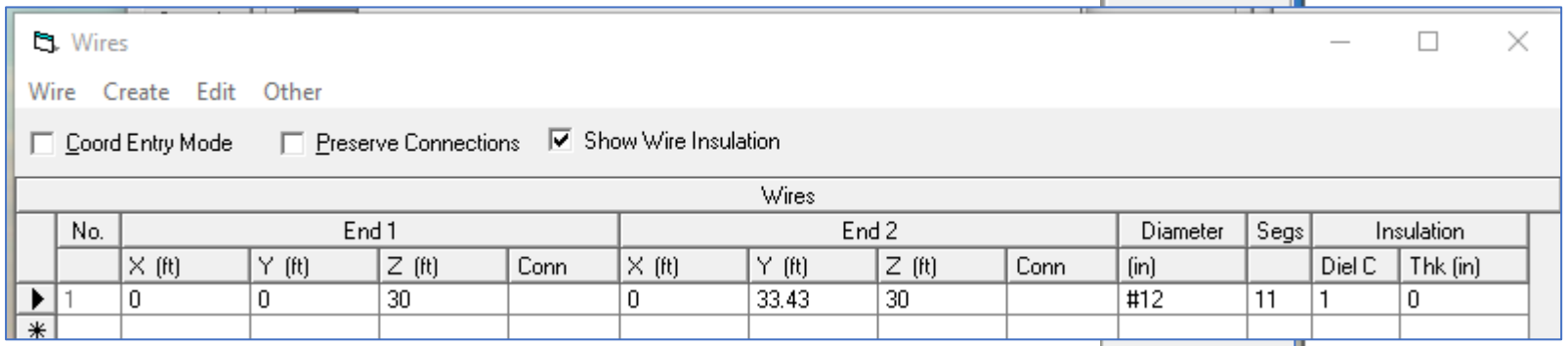
- The stick-view representation of the Back yard dipole antenna appears.



Where Do the Wires Information Reside

- Click the information window “Wires.”
- The tabular (stick) view information window for the antenna appears.

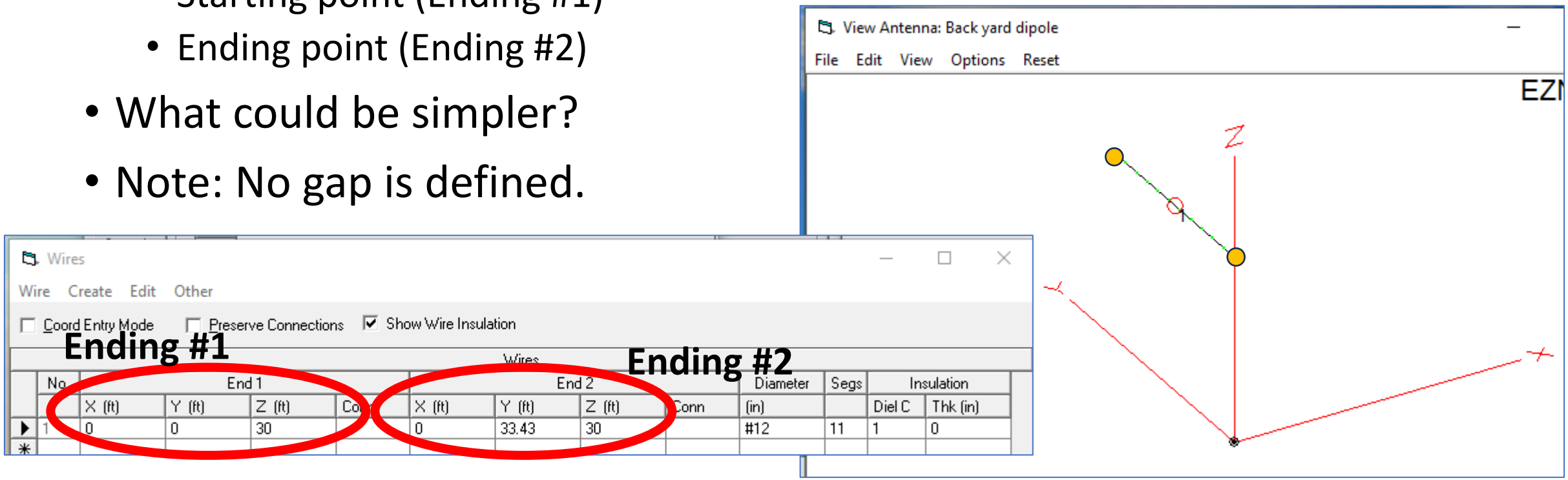




No.	End 1				End 2				Diameter	Segs	Insulation	
	X (ft)	Y (ft)	Z (ft)	Conn	X (ft)	Y (ft)	Z (ft)	Conn	(in)		Diel C	Thk (in)
1	0	0	30		0	33.43	30		#12	11	1	0

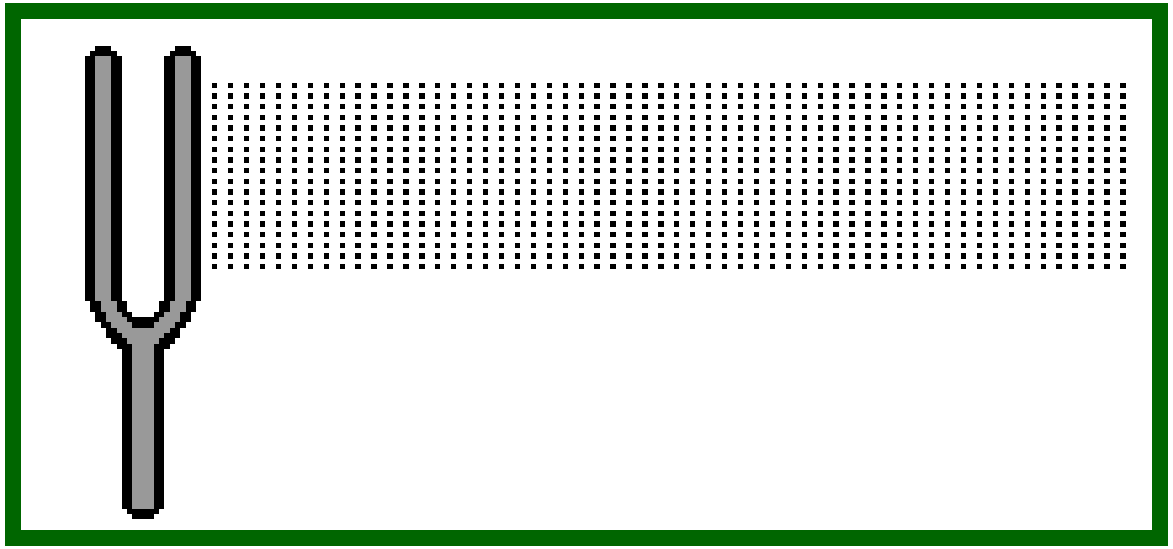
Stick-View, Tabular Representation

- There is one wire making up this antenna.
- The tabular (stick) view information window for the antenna appears.
  - Starting point (Ending #1)
  - Ending point (Ending #2)
- What could be simpler?
- Note: No gap is defined.



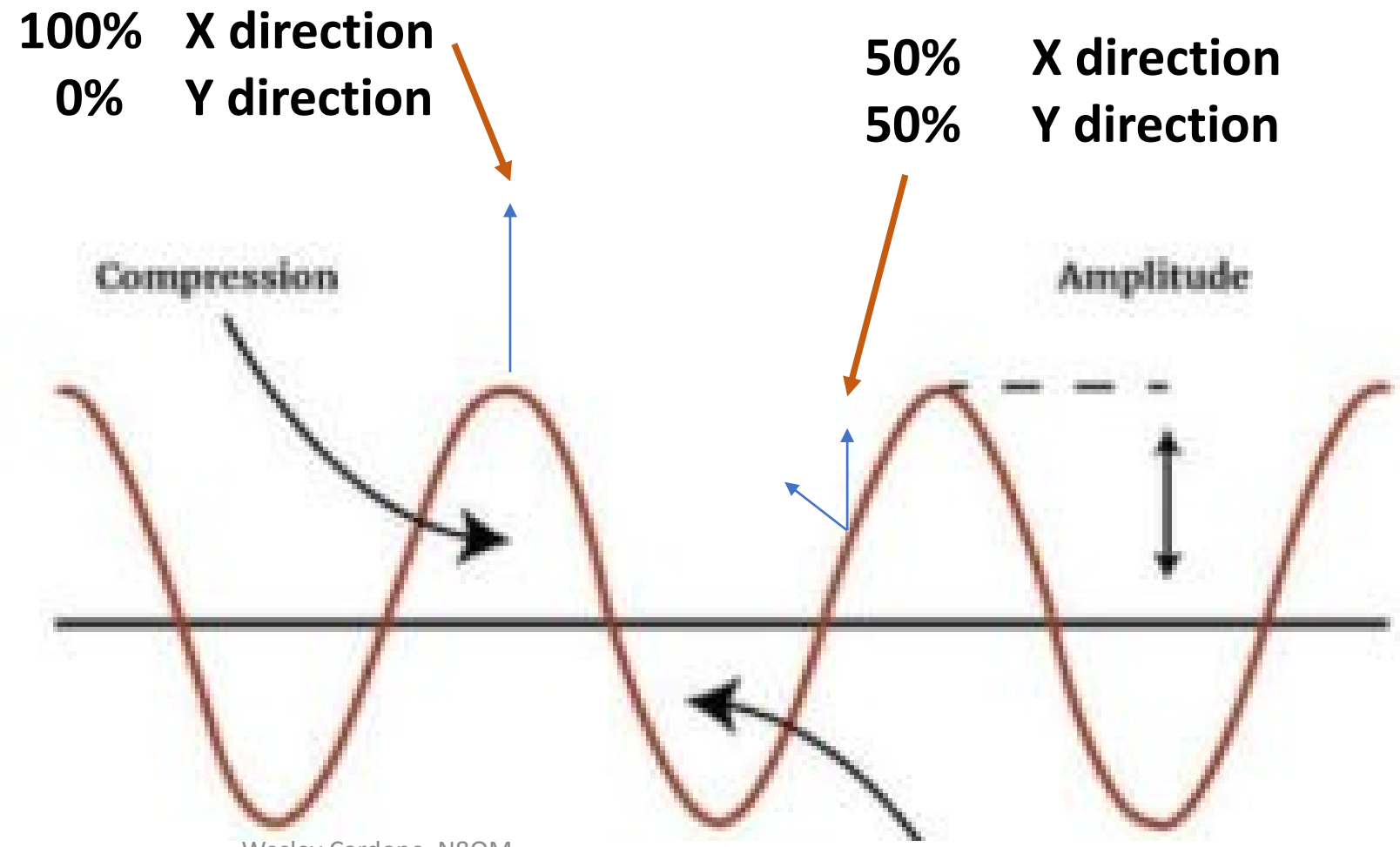
Time for Some Wave Theory

- Piano String and acoustic energy
- Fork movement creates pressure interpreted by your ear as a sound.
- What vector direction does it have?
  - Some direction in X
  - Some direction in Y
- What happens when you pluck a guitar string?
- It moves and creates acoustic energy by barometric pressure changes.



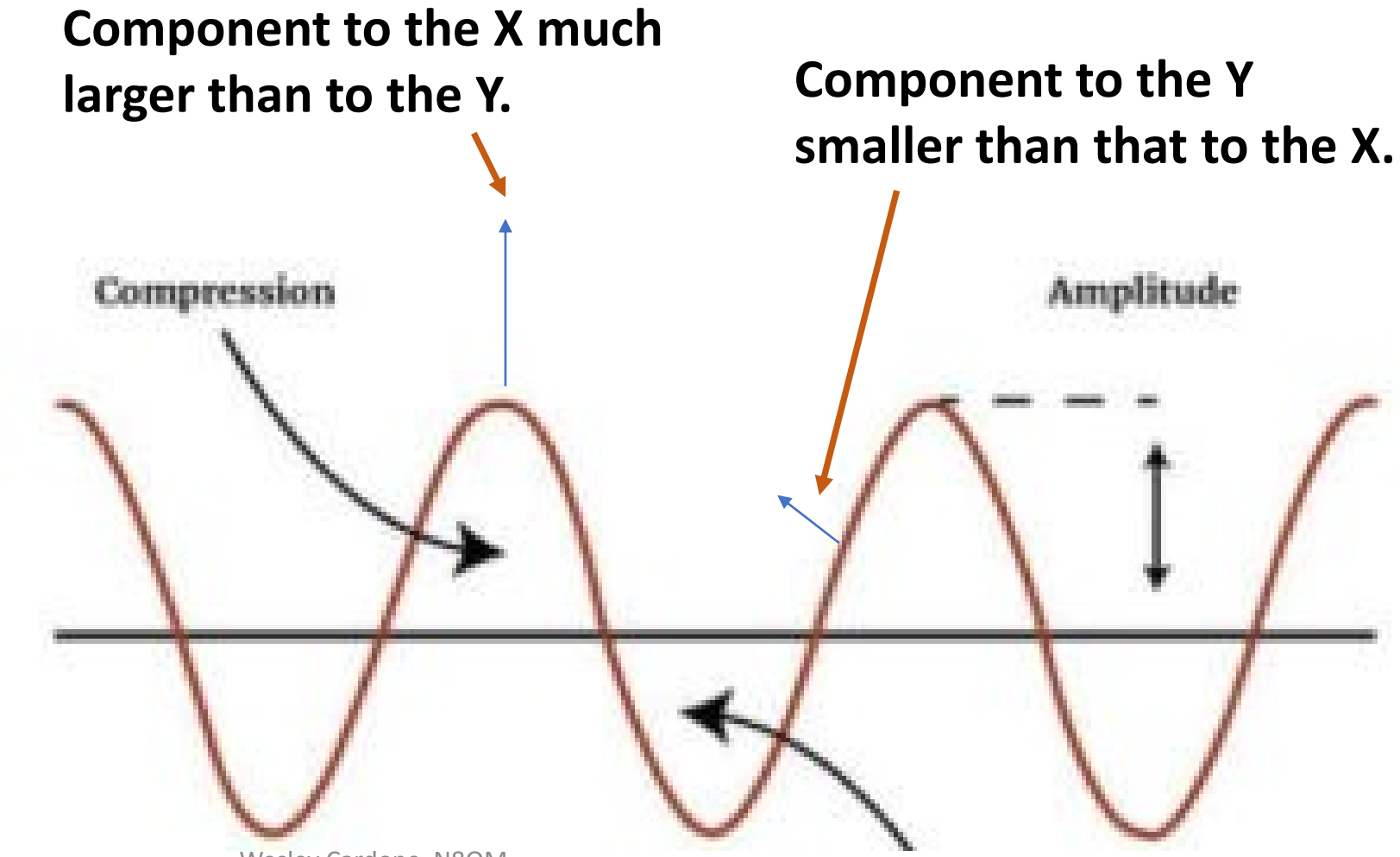
Pluck a Piano String

- Pluck a guitar or piano string and it vibrates.
- Crest of wave only pushes to the X
- Mid-position splits energy between X and Y.
- What does this mean?



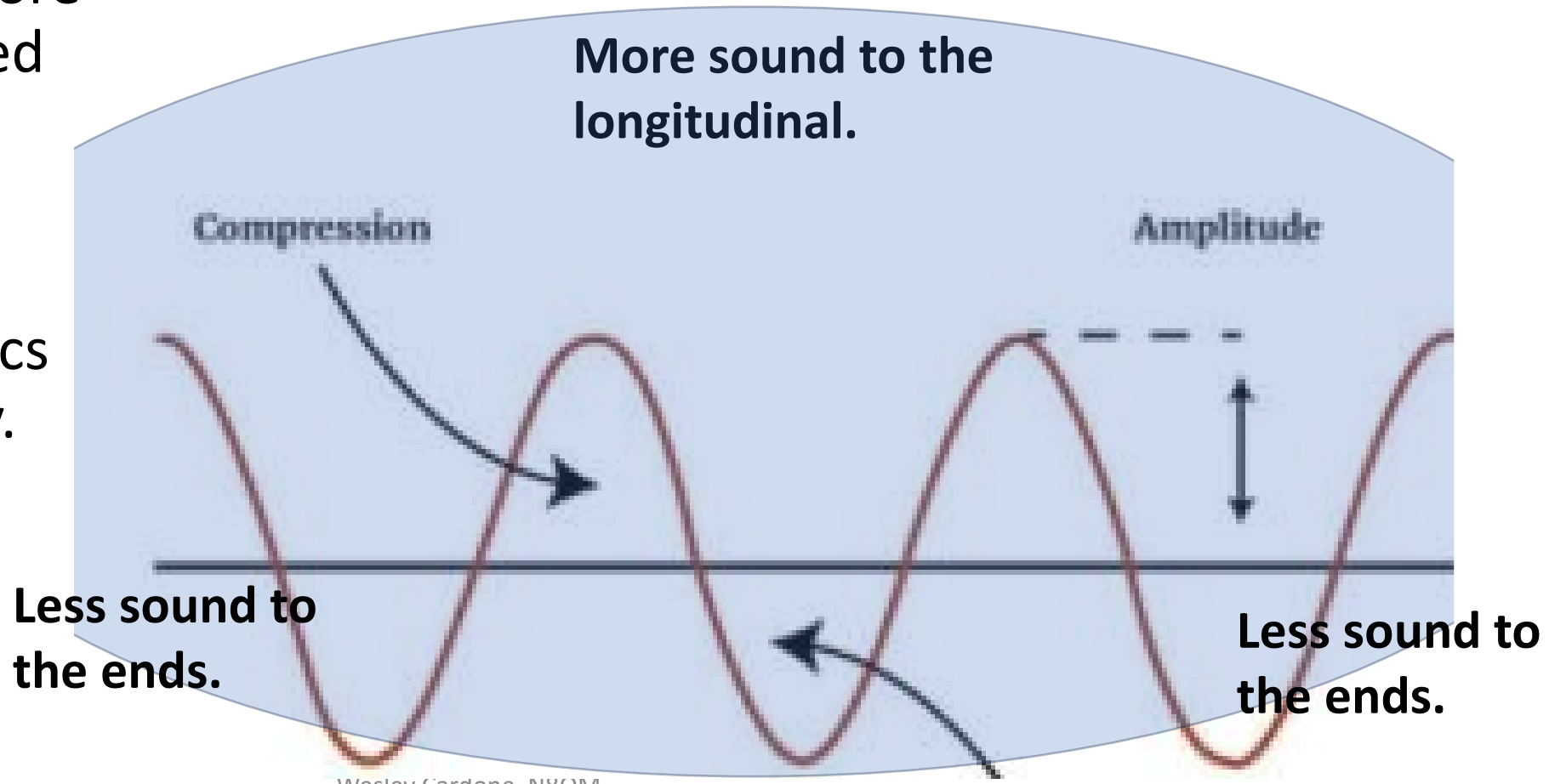
Pluck a Piano String

- It means that more energy is directed to the X than to the Y.



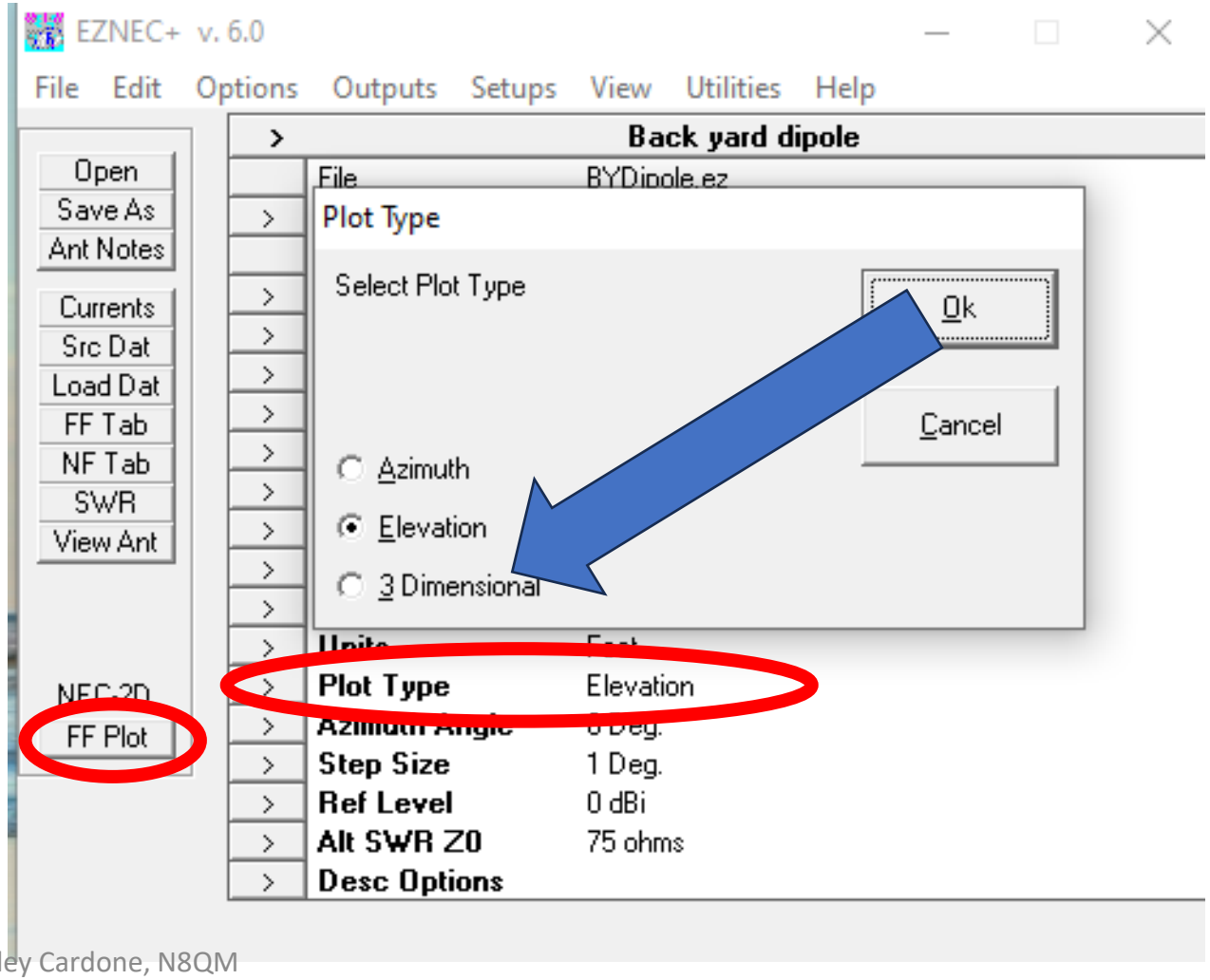
The Resulting Sound Envelope

- It means that more energy is directed to the X than to the Y.
- This applies to electro-magnetics in the same way.
- Remember that thought.



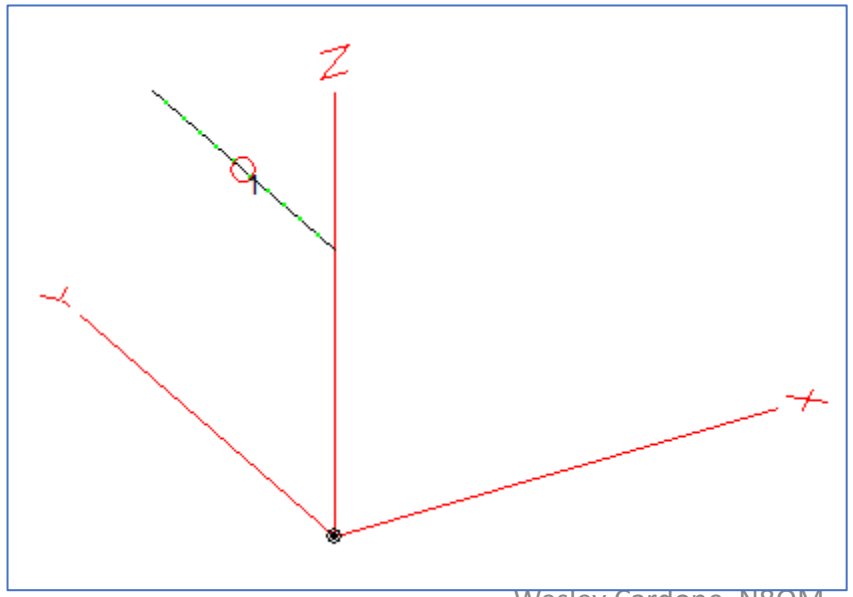
The Radiation Pattern

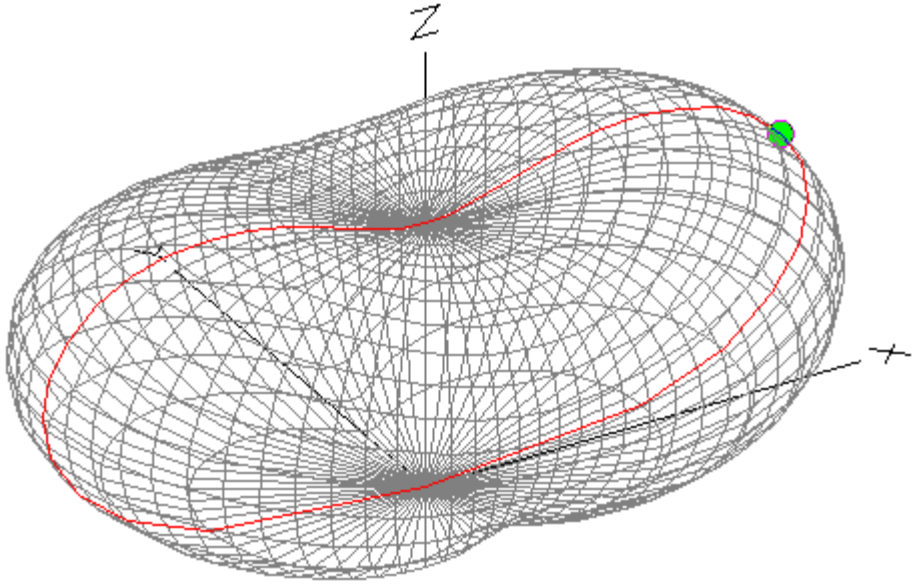
- Click on the information window “Plot Type.”
- Click “3 Dimensional.”
- Then Ok.
- Then click the action button “FF Plot.”
- This calls the far-field plot.



The Radiation Pattern

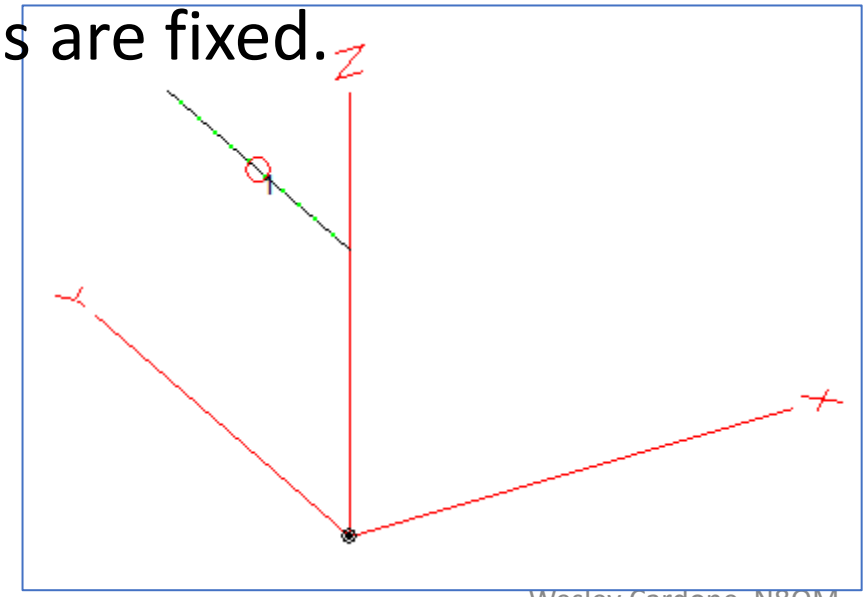
- You are looking at a very fat doughnut having almost no hole.
- Position the two windows for comparison.
- Take a moment to visually correlate the 3 axes.

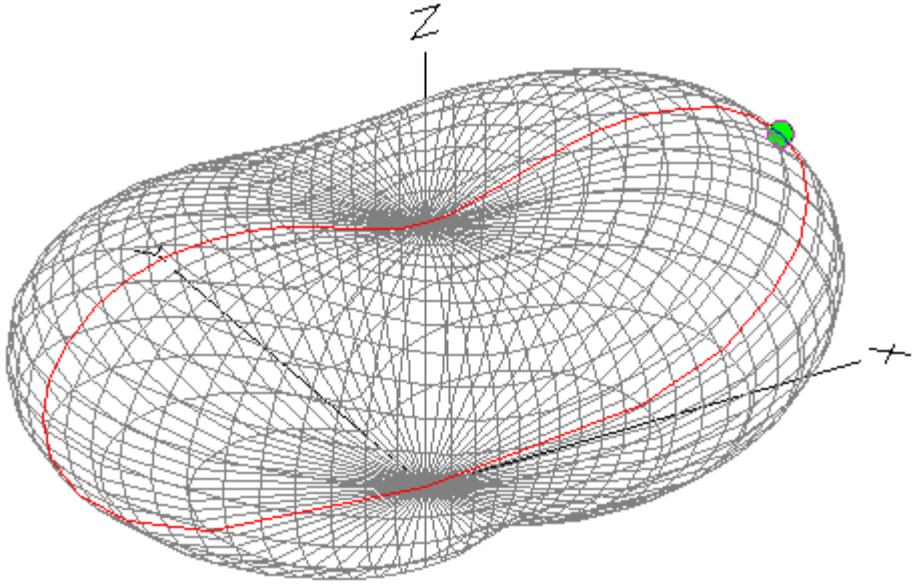




The Radiation Pattern

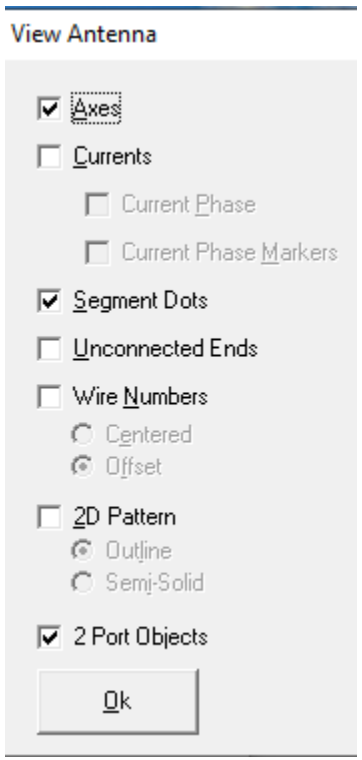
- Now think about the piano string.
- There is no movement
  - At either end or
  - At the center.
- These points are fixed.

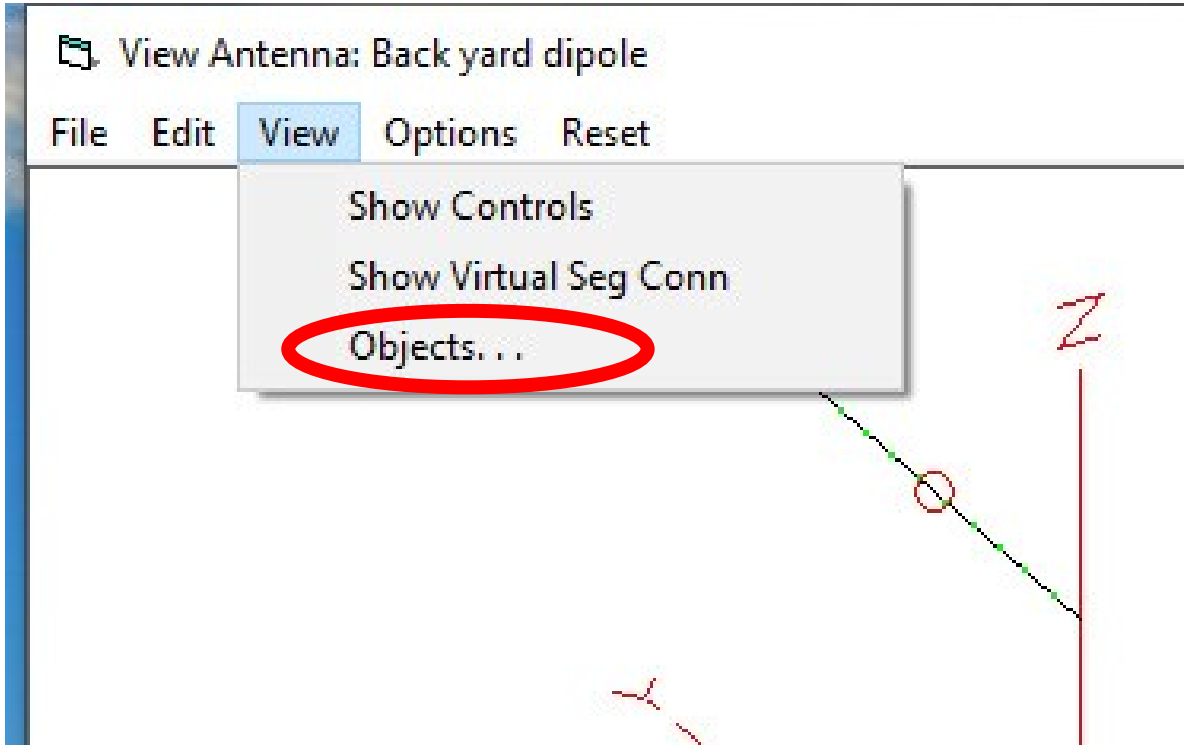




Add to the View

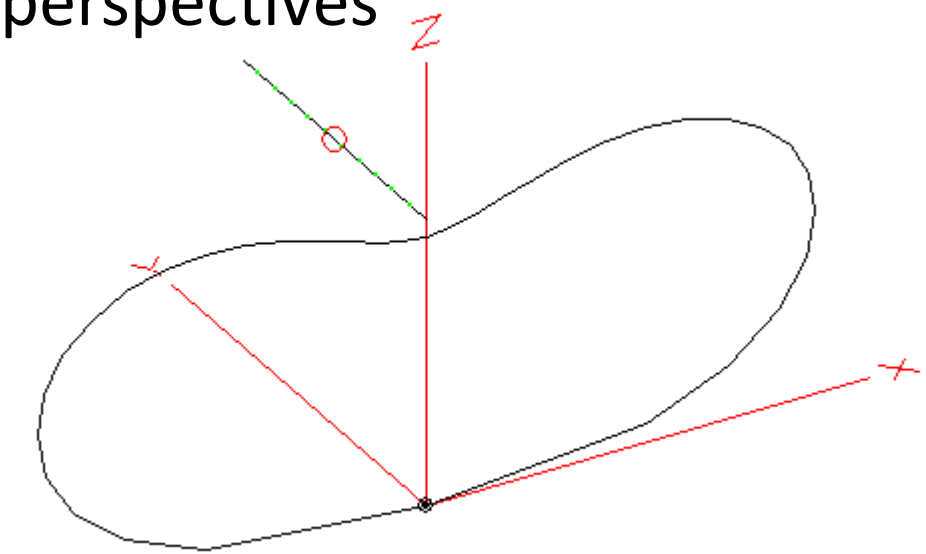
- In the “View” menu
  - Click “Objects…”

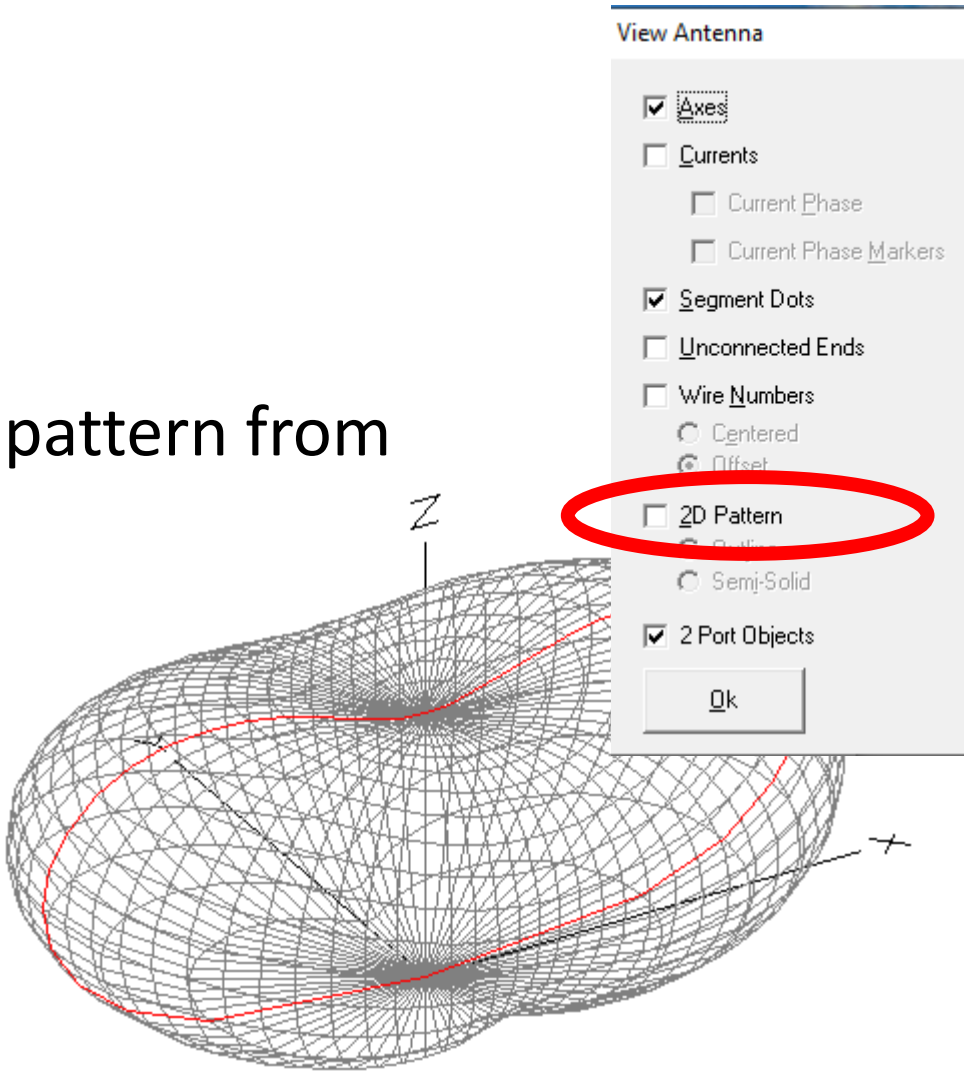




Add to the View

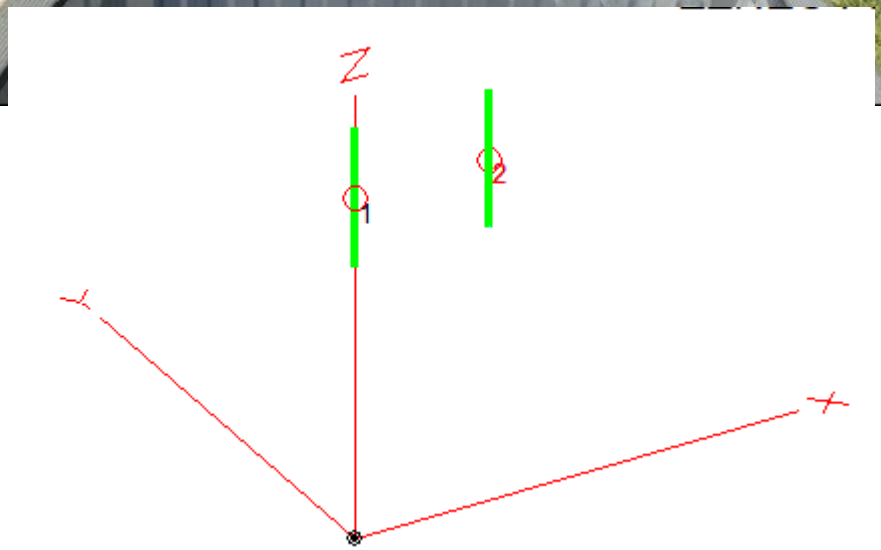
- Click “2D Pattern.”
- Is it making more sense now?
- There are several ways to view a radiation pattern from different perspectives





Experiment

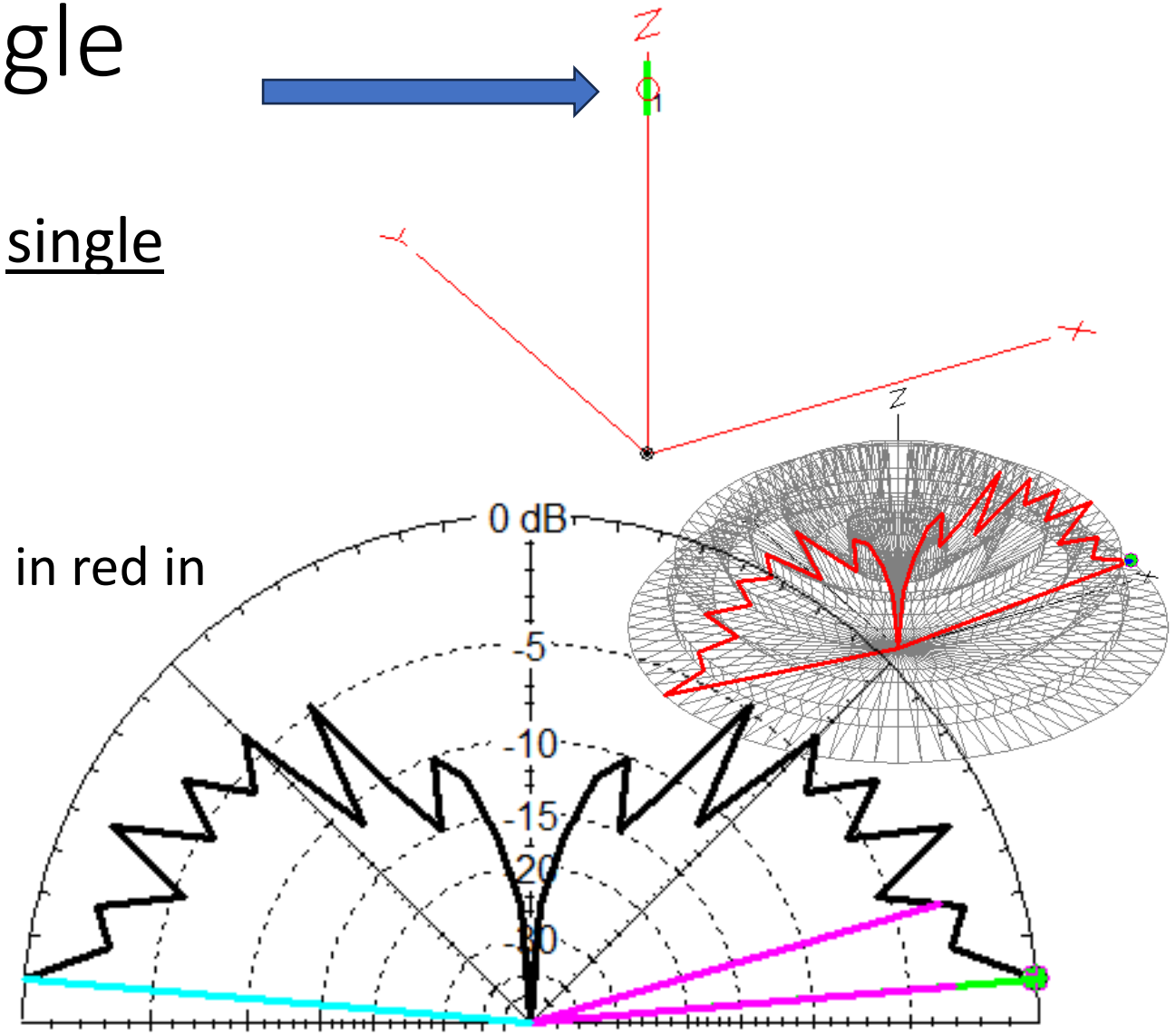
- Two dipole verticals
  - Separated by a half-wavelength
  - Fed at zero degrees phase…
  - Will concentrate energy front to back.
- But there is not enough width to mount the antennas a half-wavelength apart.
- Solution: make up for the lost half-wavelength by adding the correct phase difference to the second feed.



No.	End 1				End 2				Diameter	Segs
	X (m)	Y (m)	Z (m)	Conn	X (m)	Y (m)	Z (m)	Conn	(mm)	
1	0	0	7		0	0	7.976		#12	100

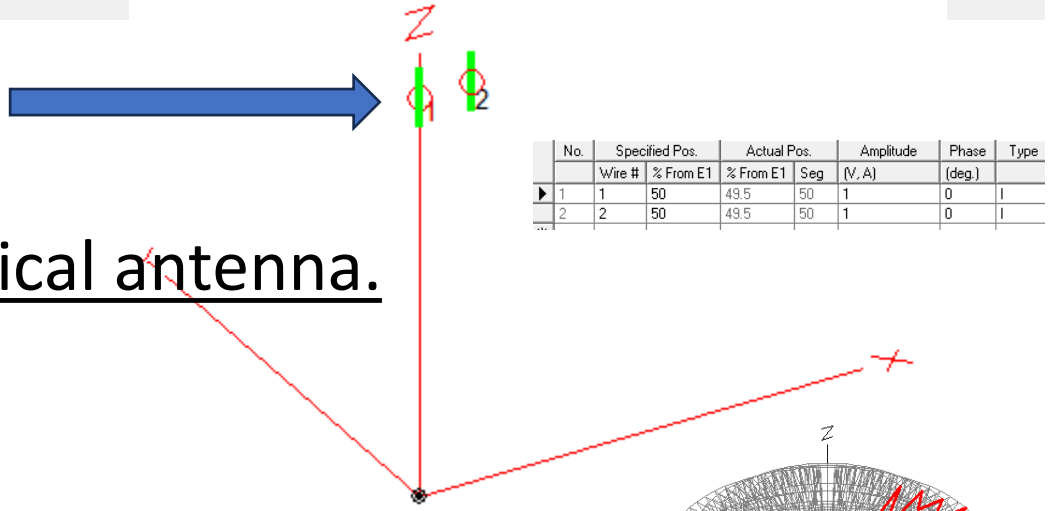
Radiation Pattern Single

- Plot the radiation pattern for a <u>single vertical antenna.</u>
- Witness
  - 3D pattern
  - 2D pattern showing that marked in red in the 3D pattern



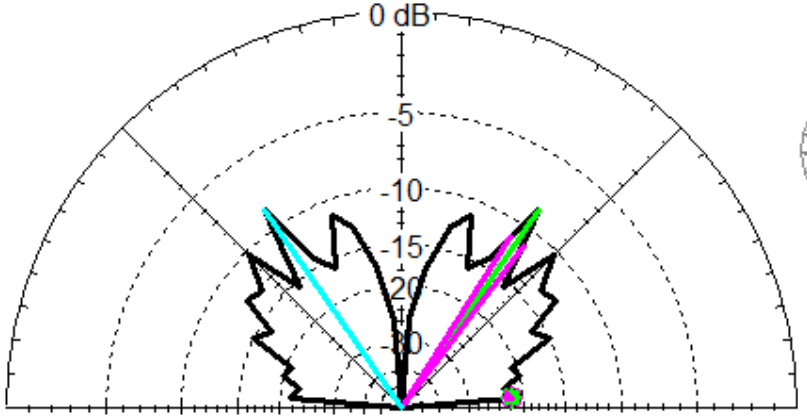
No.	End 1				End 2				Diameter	Segs	Insulation		
	X (m)	Y (m)	Z (m)	Conn	X (m)	Y (m)	Z (m)	Conn	(mm)		Diel C	Thk (mm)	Los
1	0	0	7		0	0	8.015		#12	100	1	0	0
2	0.97602	0	7		0.97602	0	8.015		#12	100	1	0	0

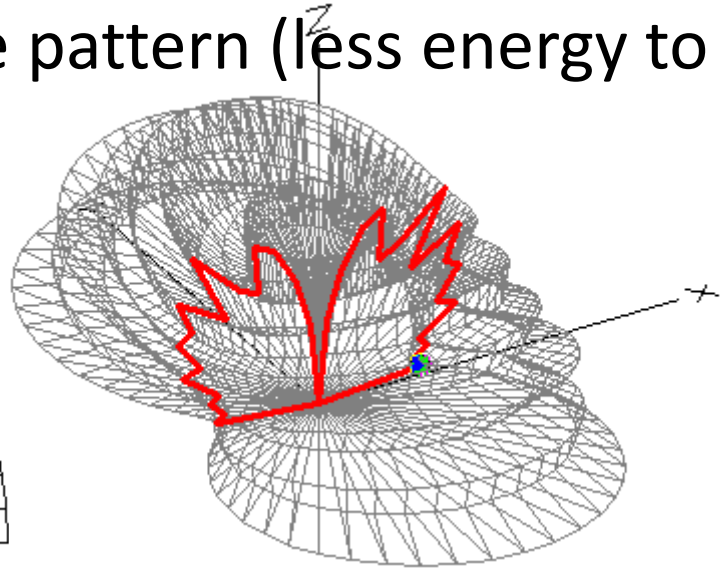
Radiation Pattern Dual

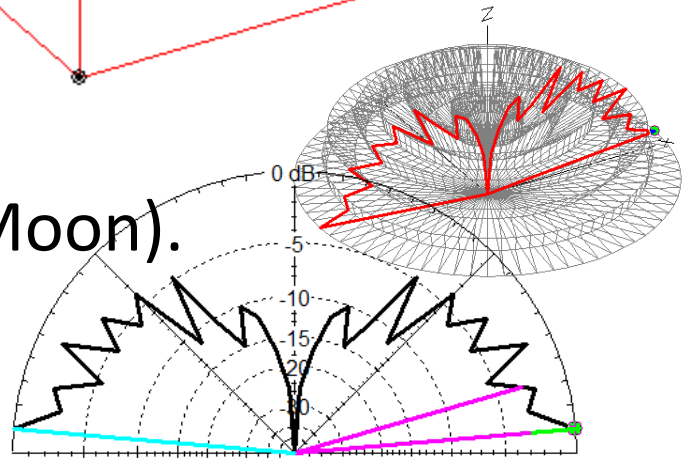


No.	Specified Pos.		Actual Pos.		Amplitude	Phase	Type
	Wire #	% From E1	% From E1	Seg	(V, A)	(deg.)	
1	1	50	49.5	50	1	0	I
2	2	50	49.5	50	1	0	I

- Plot the radiation pattern for a <u>dual vertical antenna.</u>
- Witness
  - Squashed side-to-side pattern
  - Elongated front-to-rear pattern
- But can we squash the pattern (less energy to the Moon).



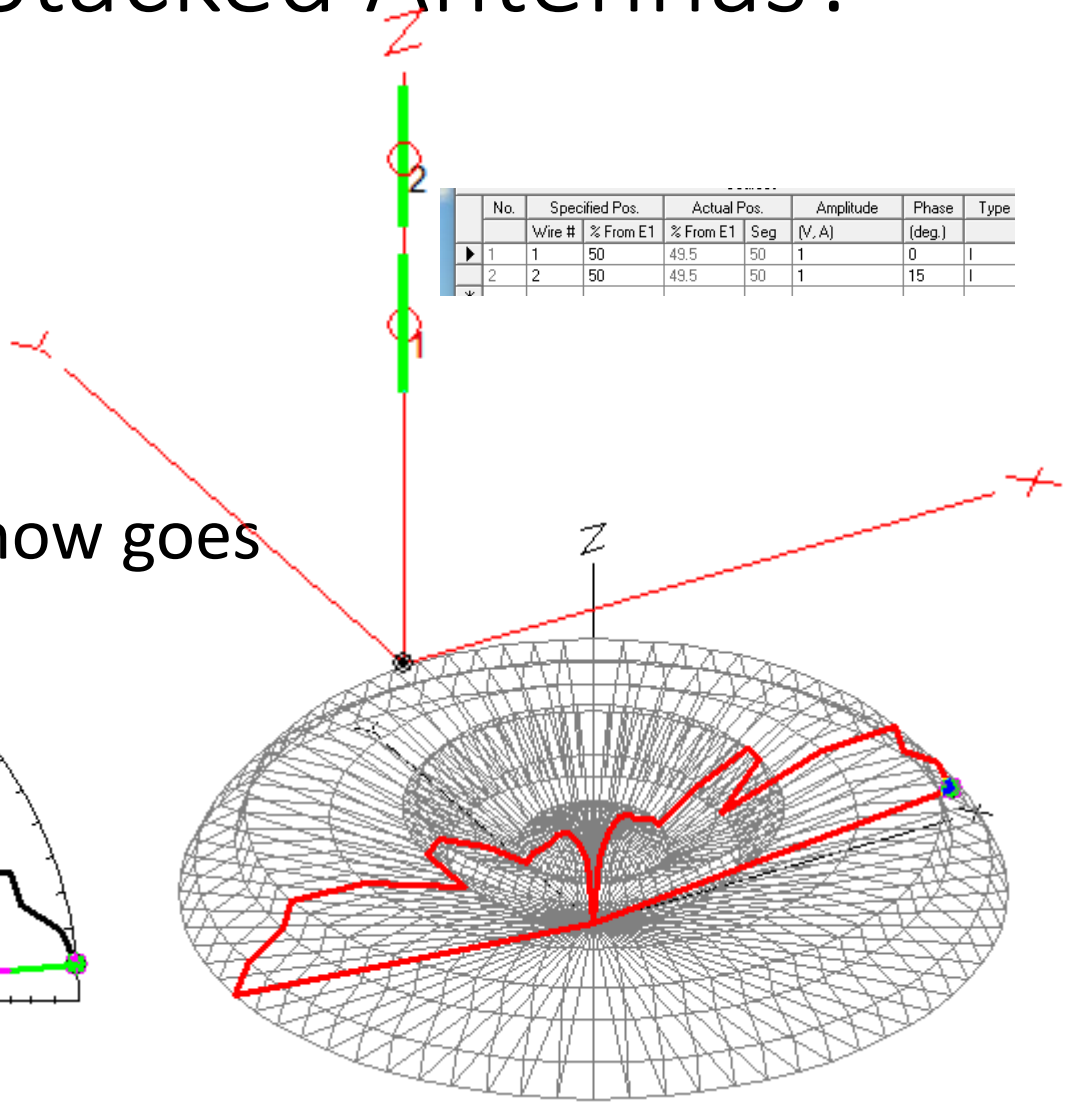




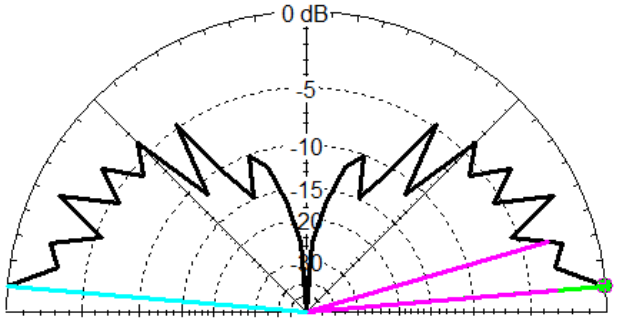
	X (m)	Y (m)	Z (m)	Conn	X (m)	Y (m)	Z (m)	Conn	(mm)		Diel C	Thl
1	0	0	2		0	0	2.97603		#12	100	1	0
2	0	0	3.22004		0	0	4.19607		#12	100	1	0

What Would Happen with Stacked Antennas?

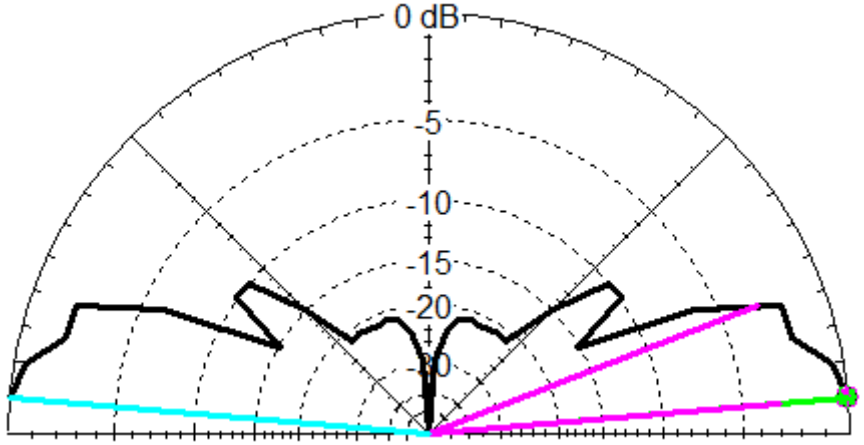
- Dual stacked verticals
- Wire #2 phased at 15° (solved by iteration)
- Gap λ/8 which is 0.244 meters
  - $\frac{299.79}{146} 0.95 \frac{1}{4} = 0.4538 \text{ meters}$
- Energy otherwise directed to the moon now goes to the horizon.



No.	Specified Pos.		Actual Pos.		Amplitude	Phase	Type
	Wire #	% From E1	% From E1	Seg	(V, A)	(deg.)	
1	1	50	49.5	50	1	0	I
2	2	50	49.5	50	1	15	I



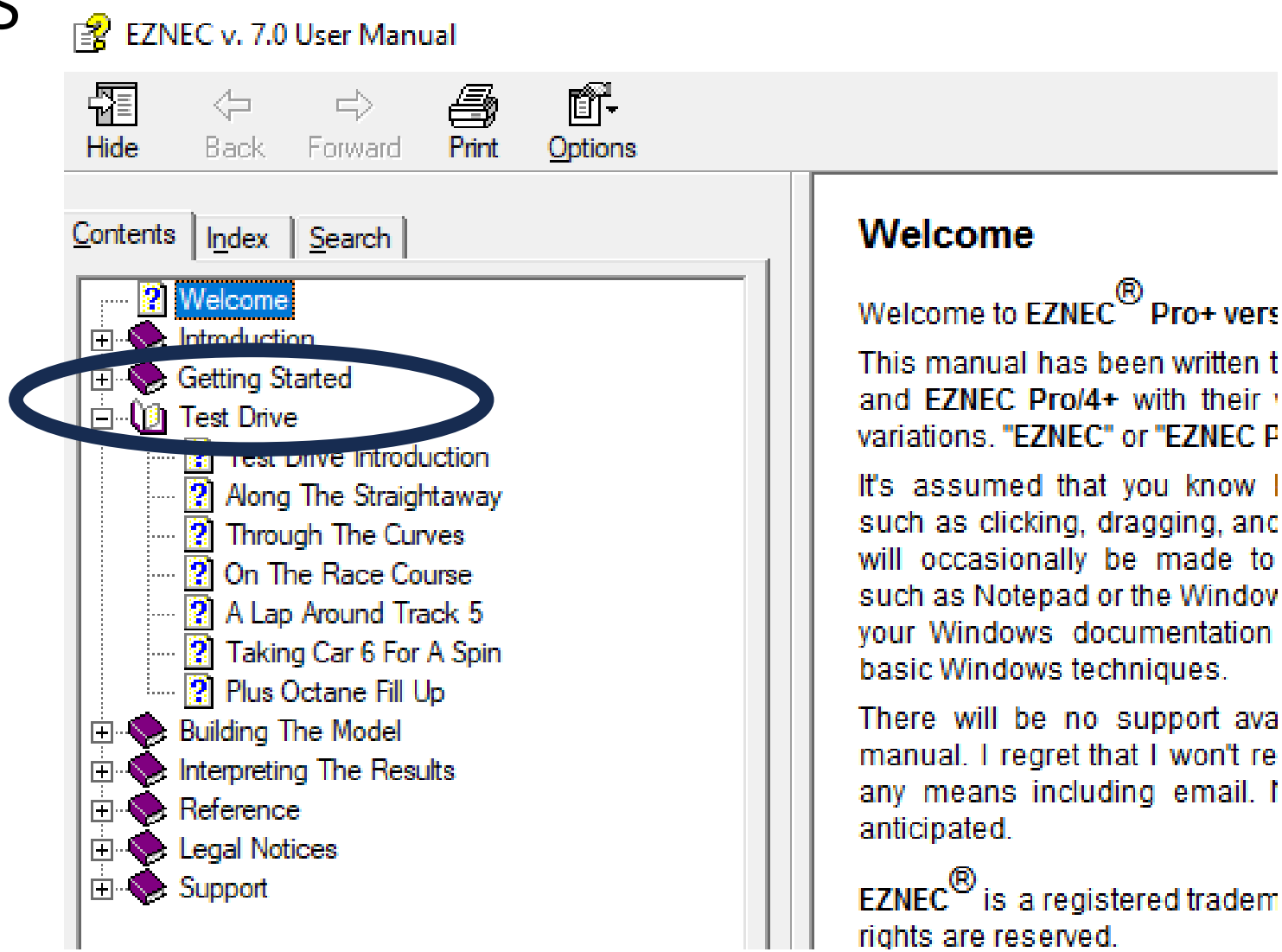
Single Vertical



Dual Stacked Vertical

Your Next Steps

- You are invited to take the EZNEC "Test Drive."
  - Is organized according to skill level.
  - Along the Straightaway
    - Gets you started with the uttermost basics.
  - Through the Curves
    - Adds some easy stuff
  - And the tutorial list goes on.



Questions


KD8RFW
JIM
The
I Hate Cook Books
Guide to
Amateur
Radio
Electromagnetics
For the
Masses
Wes Cardone
N8QM
Original Information Courtesy of
the Chelsea Amateur Radio Club