EZNEC for Hams

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EZNEC Antenna Modeling

- https://www.eznec.com/
- **EZNEC Pro+ v. 7.0 is now available! – FREE**
- **W7EL –** Roy Lewallen retired
- EZNEC by Roy dates to about 1990 – which provides a friendly interface/wrapper for NEC
- NEC (Numerical Electromagnetics Code) engine originally written in the 1970's by staff at Lawrence Livermore National Lab
- NEC2 is public – there are also NEC4 and NEC5 versions

Resources

- W8WWV EZNEC tutorial
- https://eznec.com/misc/EZNEC_Printable_Manual/7.0/EZW70_User_Manual.pdf
- http://www.arrl.org/antenna-modeling-for-beginners
- http://www.arrl.org/antenna-modeling-files
- http://www.arrl.org/arrl-antenna-book-reference
- https://www.fars.k6ya.org/docs/k6oik
- Many sample antenna designs from simple to complex are available online

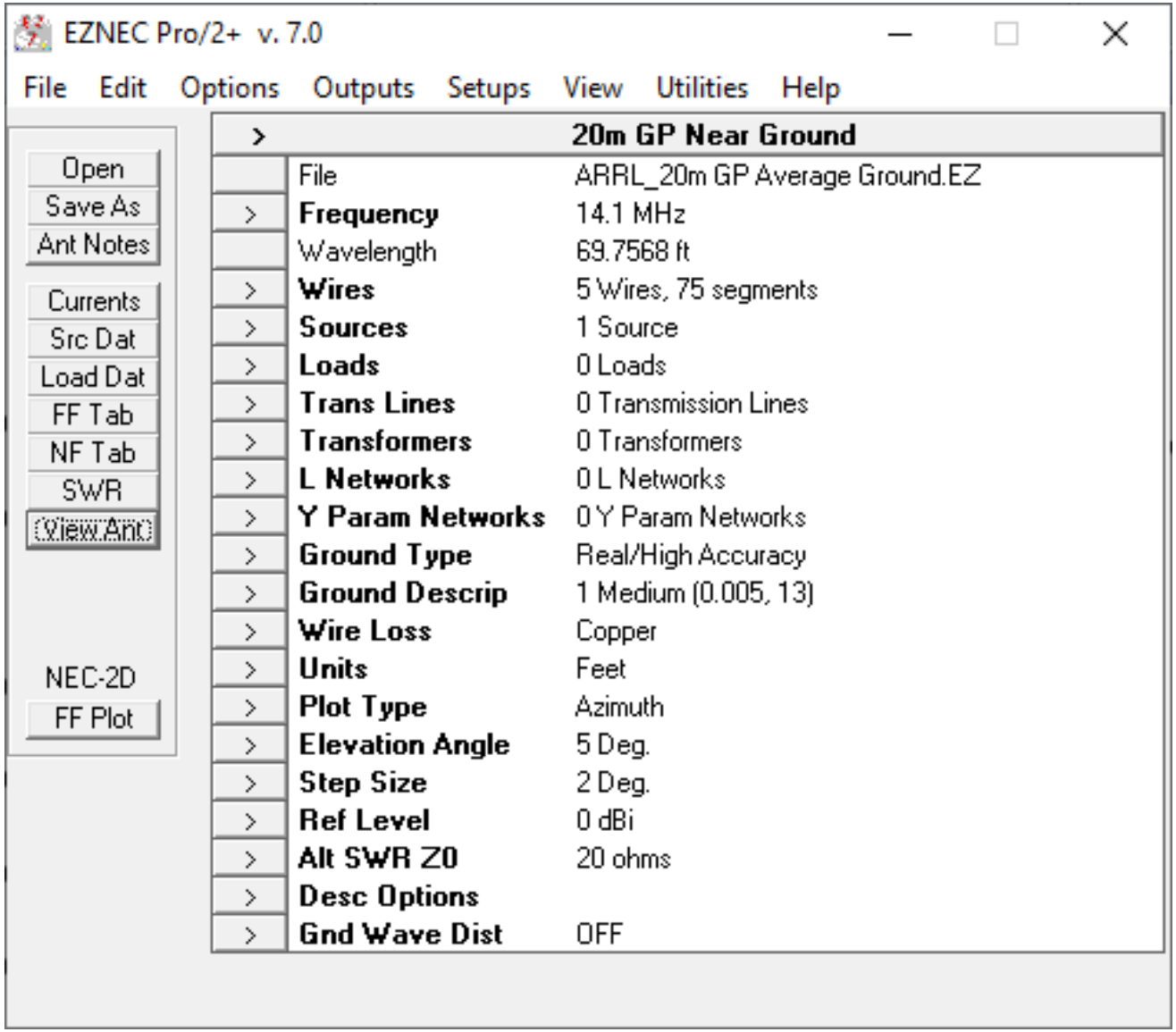
EZNEC Inputs

- Antenna wires - including pipes, radials,…
- Sources or transmitters – frequency, impedance, type
- Grounds
- Loading coils & Traps
- Transmission lines & transformers
- Frequency(ies)
- Plot type, span,…

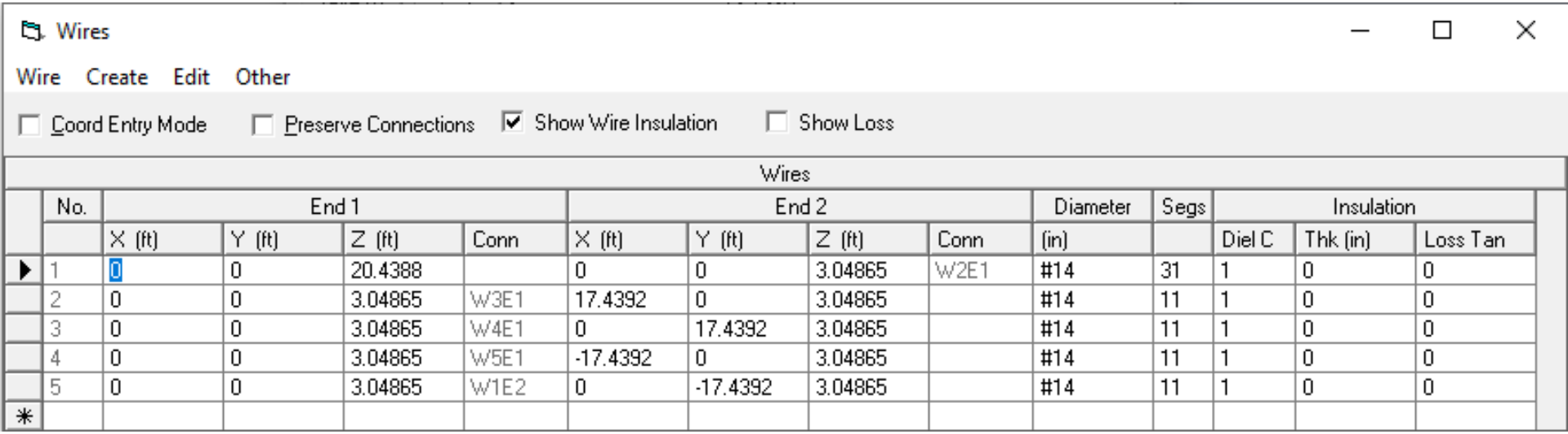
EZNEC Special Issues

- Wires are divided into segments
  - Related to analysis method
  - Needs to be set (so many per wavelength – 1/25 to 1/400 segments per wavelength)
  - Segment check helps
- Sources are centered in a segment
- Free EZNEC version does not support buried radials, but can be supported with NEC5 engine
- Telescoping tube elements require certain details

EZNEC Main Window



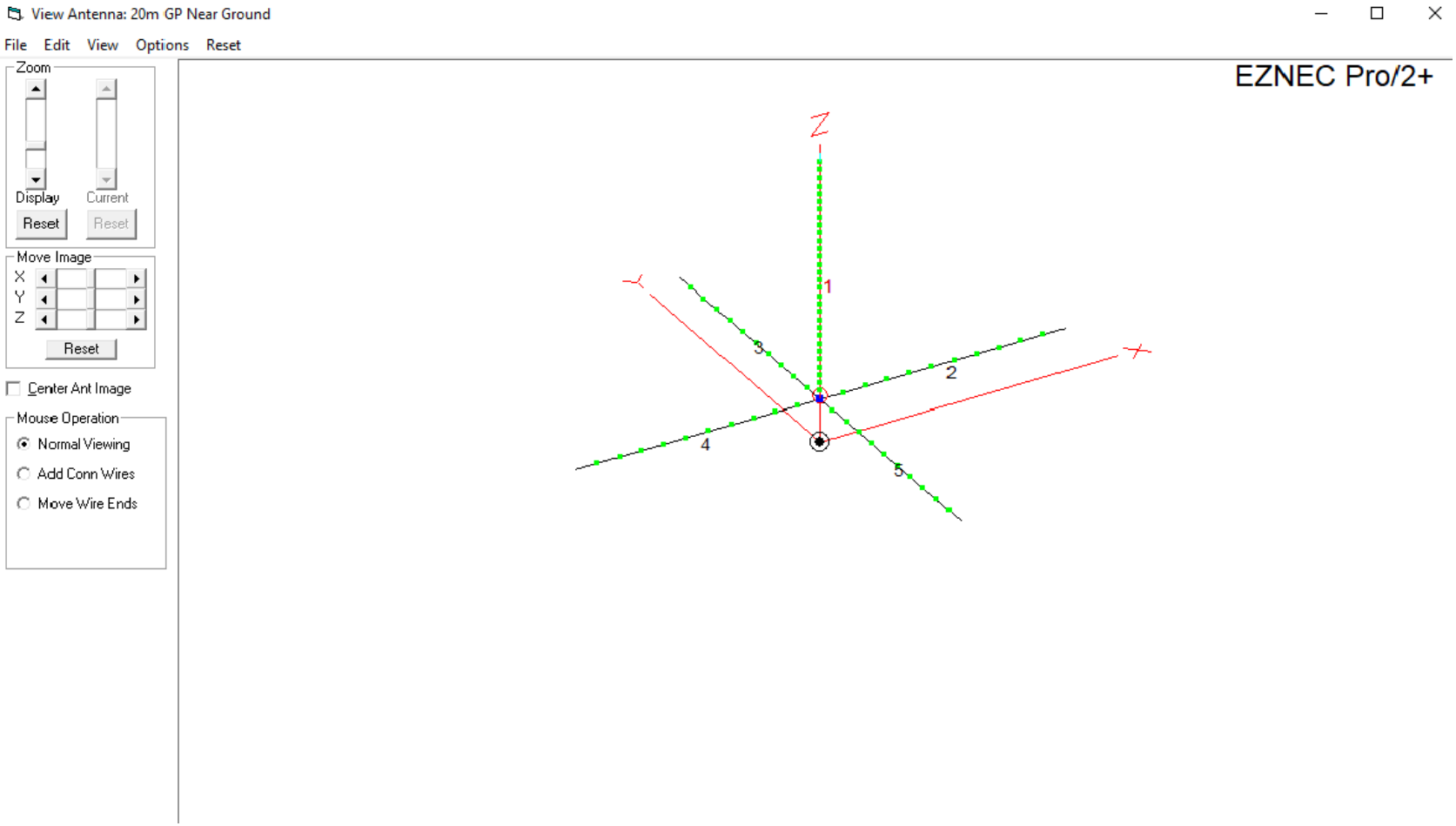
Wires



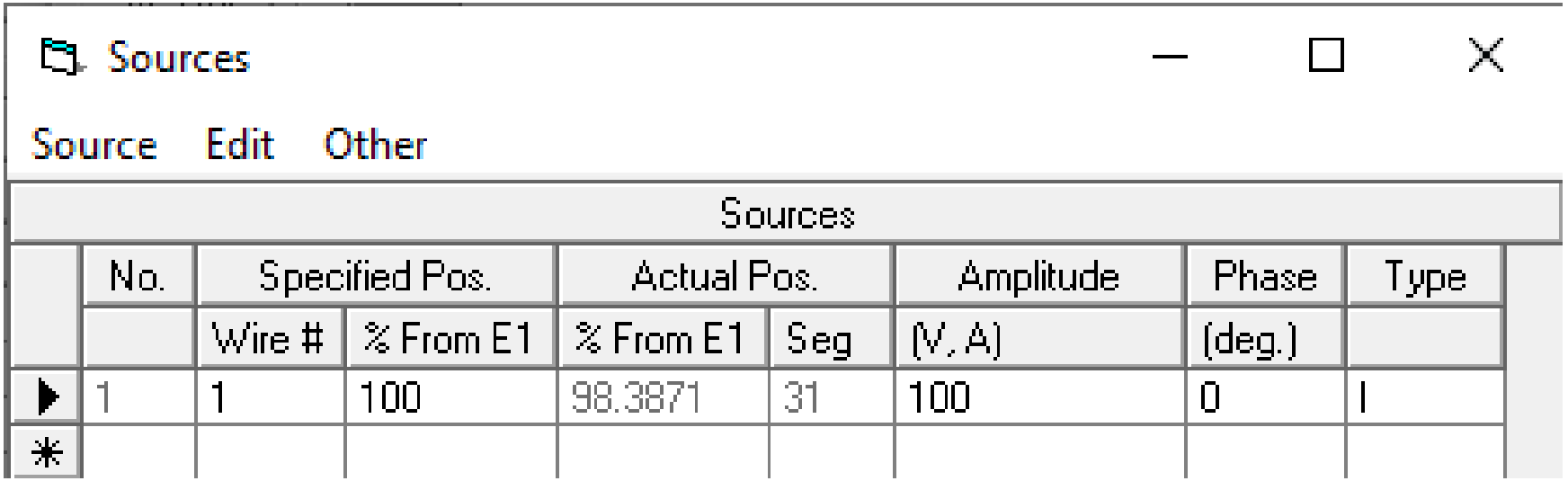
Wires

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)	Loss Tan
1	0	0	20.4388		0	0	3.04865	W2E1	#14	31	1	0	0
2	0	0	3.04865	W3E1	17.4392	0	3.04865		#14	11	1	0	0
3	0	0	3.04865	W4E1	0	17.4392	3.04865		#14	11	1	0	0
4	0	0	3.04865	W5E1	-17.4392	0	3.04865		#14	11	1	0	0
5	0	0	3.04865	W1E2	0	-17.4392	3.04865		#14	11	1	0	0
*													

View Antenna



Sources (= Transmitters)



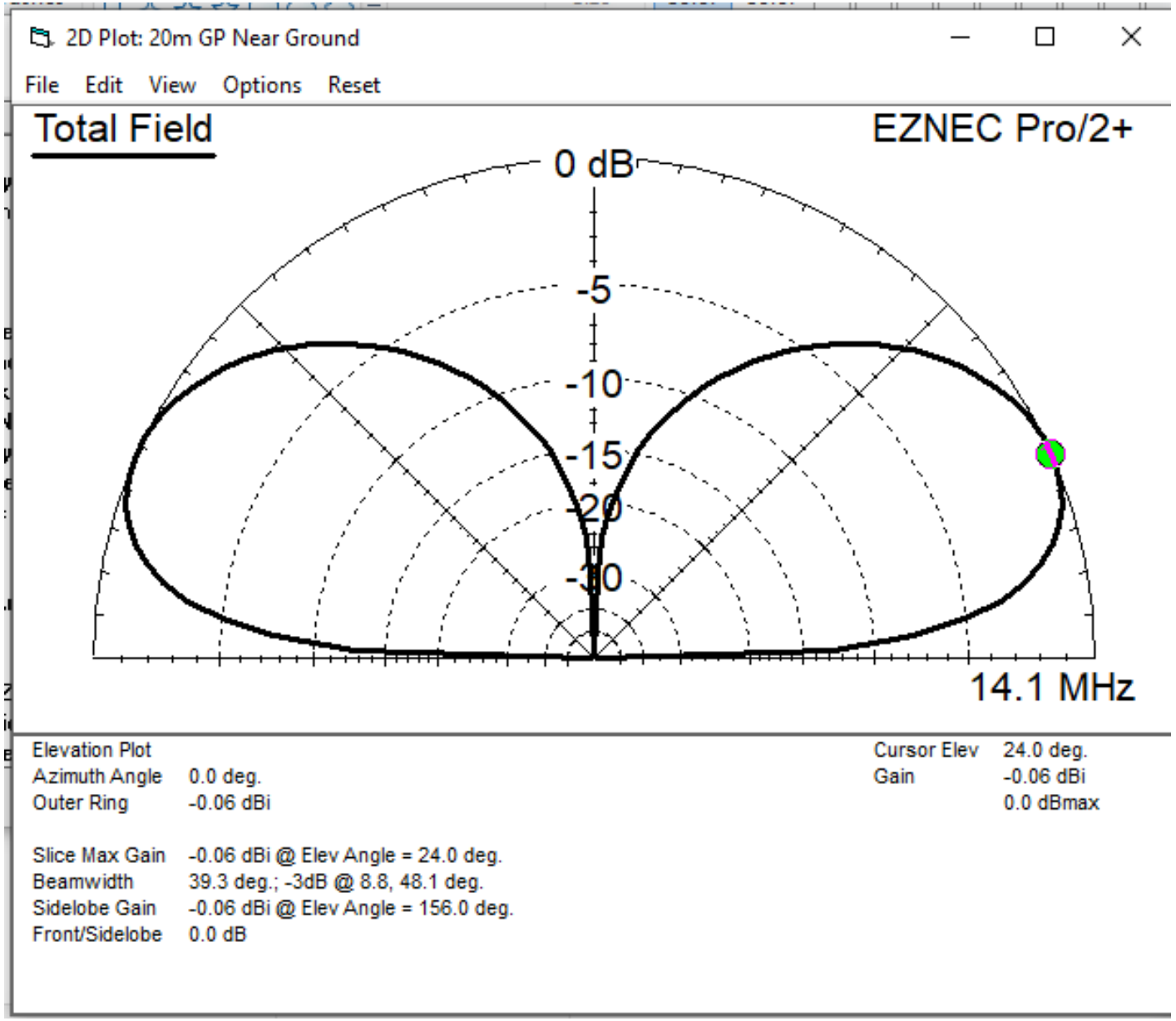
Sources

	No.	Specified Pos.		Actual Pos.		Amplitude	Phase	Type
		Wire #	% From E1	% From E1	Seg	(V, A)	(deg.)	
▶	1	1	100	98.3871	31	100	0	I
*								

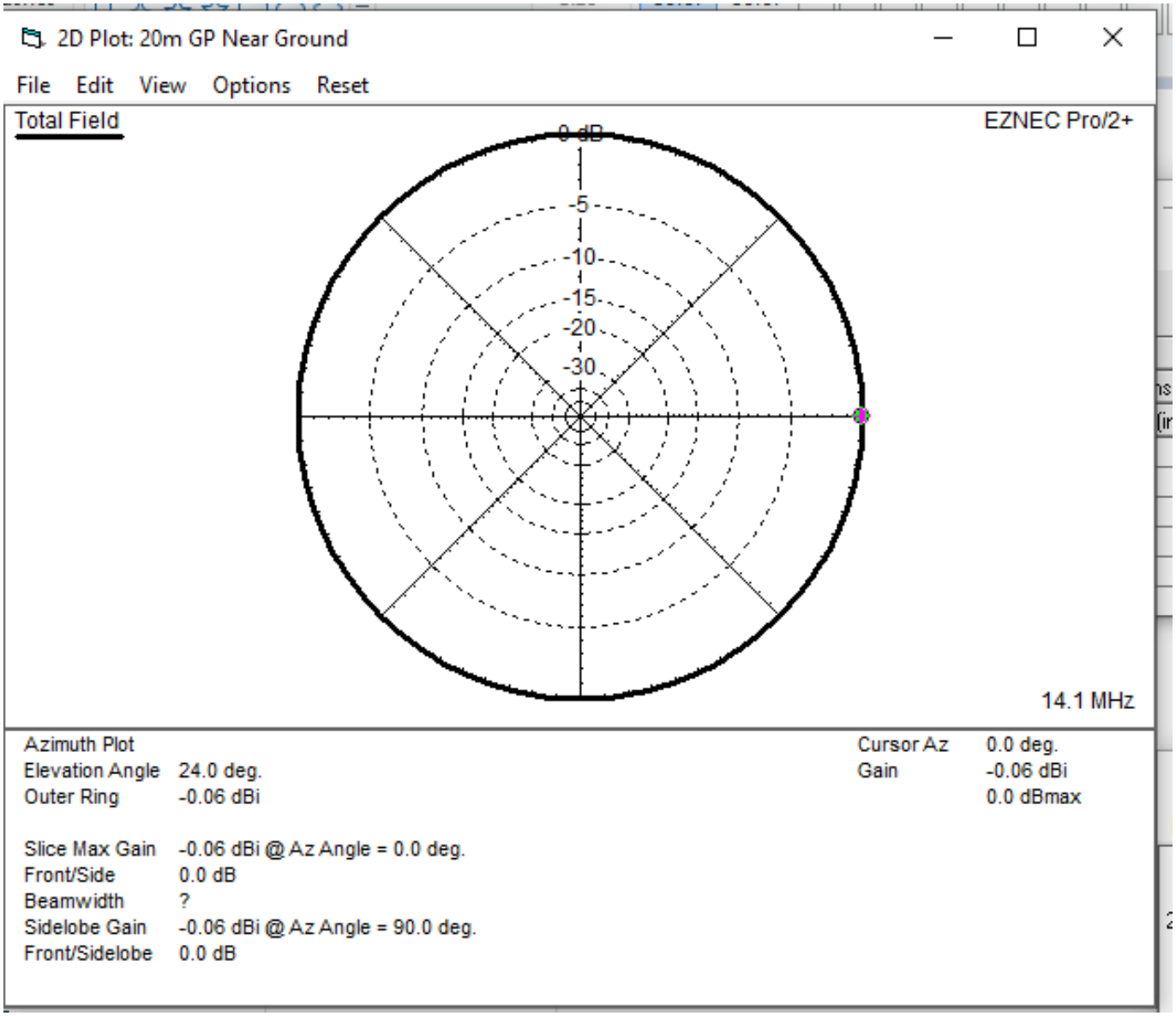
EZNEC Outputs

- Antenna Patterns
  - Azimuth
  - Elevation
- Source data
  - Impedance of the antenna
  - SWR
- SWR sweeps

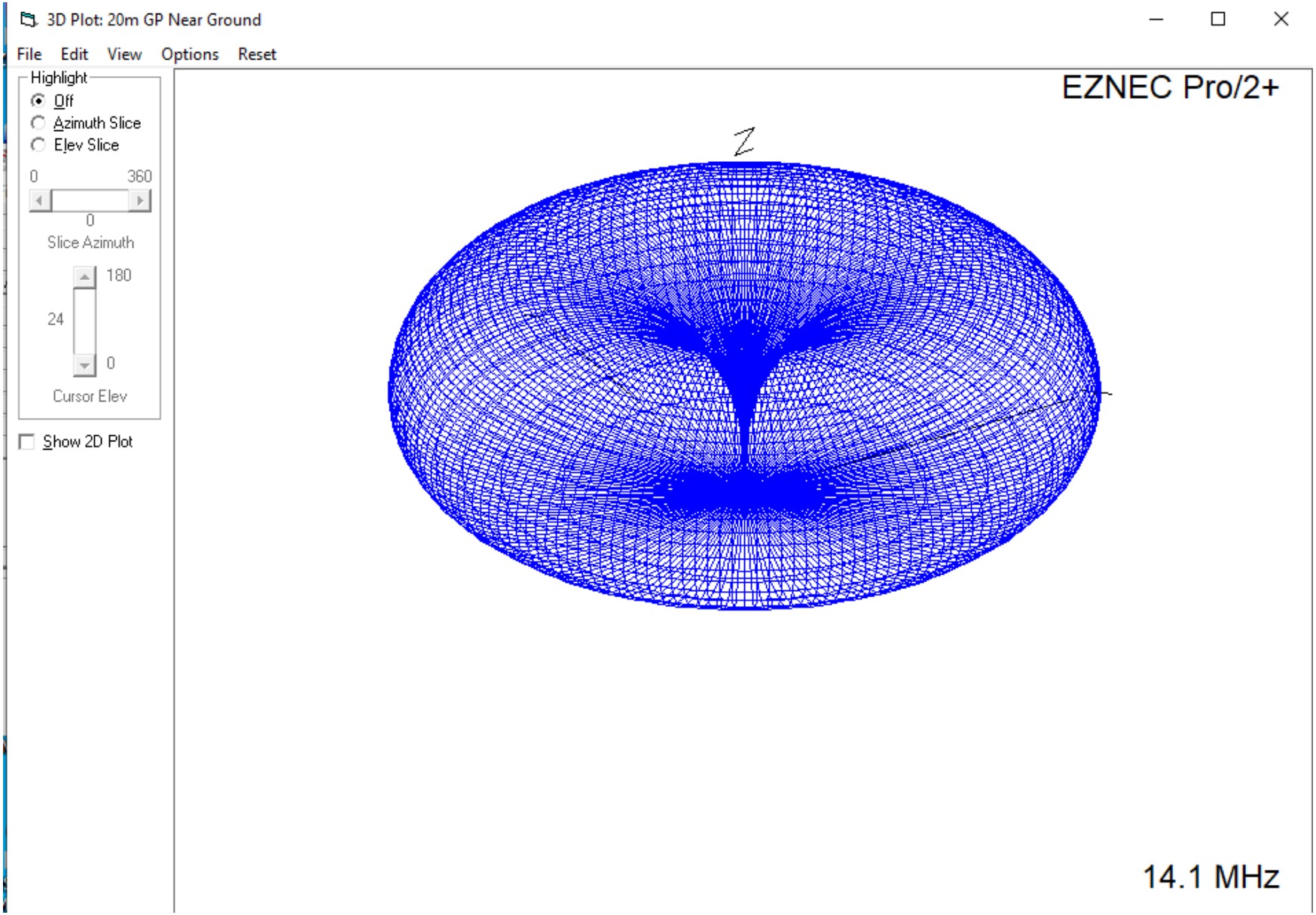
Elevation Plot for 20 Meters Vertical



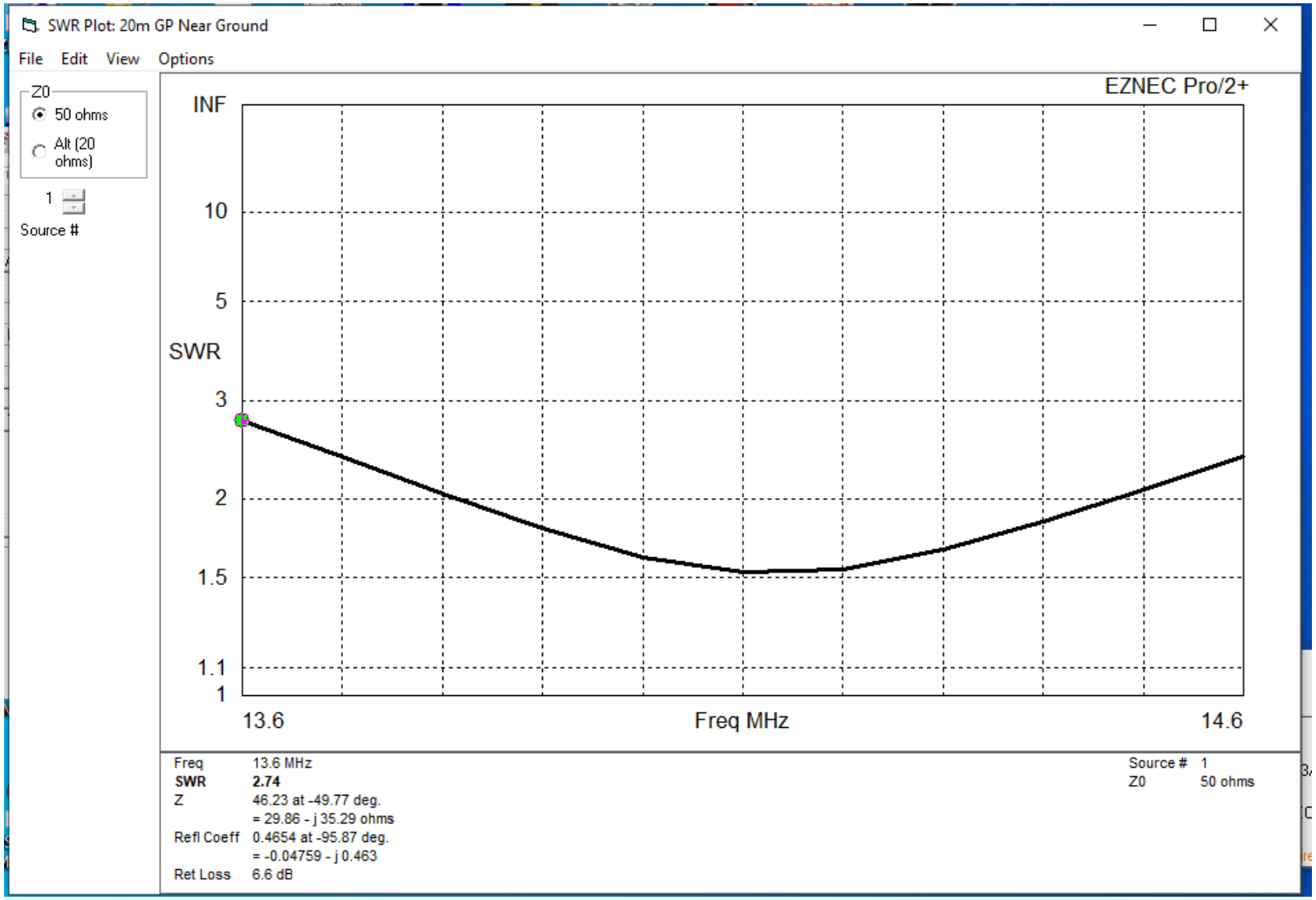
Azimuth Plot



3D Antenna Pattern



SWR Sweep


SWR Plot: 20m GP Near Ground
File Edit View Options
Z0
50 ohms
Alt (20 ohms)
1
Source #
EZNEC Pro/2+
INF
10
5
SWR
3
2
1.5
1.1
1
13.6
Freq MHz
14.6
Freq 13.6 MHz
SWR 2.74
Z 46.23 at -49.77 deg.
= 29.86 - j 35.29 ohms
Refl Coeff 0.4654 at -95.87 deg.
= -0.04759 - j 0.463
Ret Loss 6.6 dB
Source # 1
Z0 50 ohms

Other Uses For EZNEC

- Antenna Trap performance and design
- Antenna loading and tuning
- Bandwidth of antennas
- Effects between nearby antennas
- Antenna Isolation - Field Day antenna orientation & coupling
- Ground effects
- Hamfest talk
  - Field Day interference & antenna isolation using EZNEC
  - AutoEZ for antenna isolation

Field Day Antenna Studies

- 40 meters verticals 600 feet spacing
- 40 meters inverted vees at 300 feet spacing end to end
- 40 meters dipoles at 300 feet spacing end to end
- 40 meters vertical to inverted vee at 300 feet spacing broadside – or cross-polarized
- vertical to dipole off the end with tilt – near field, far field and ground reflection cancel
- fan inverted vee 80 40 20 spread
- 40 meters extended double Zepp with 20 and 15 meters traps - pattern on 20 and 15 similar to 40