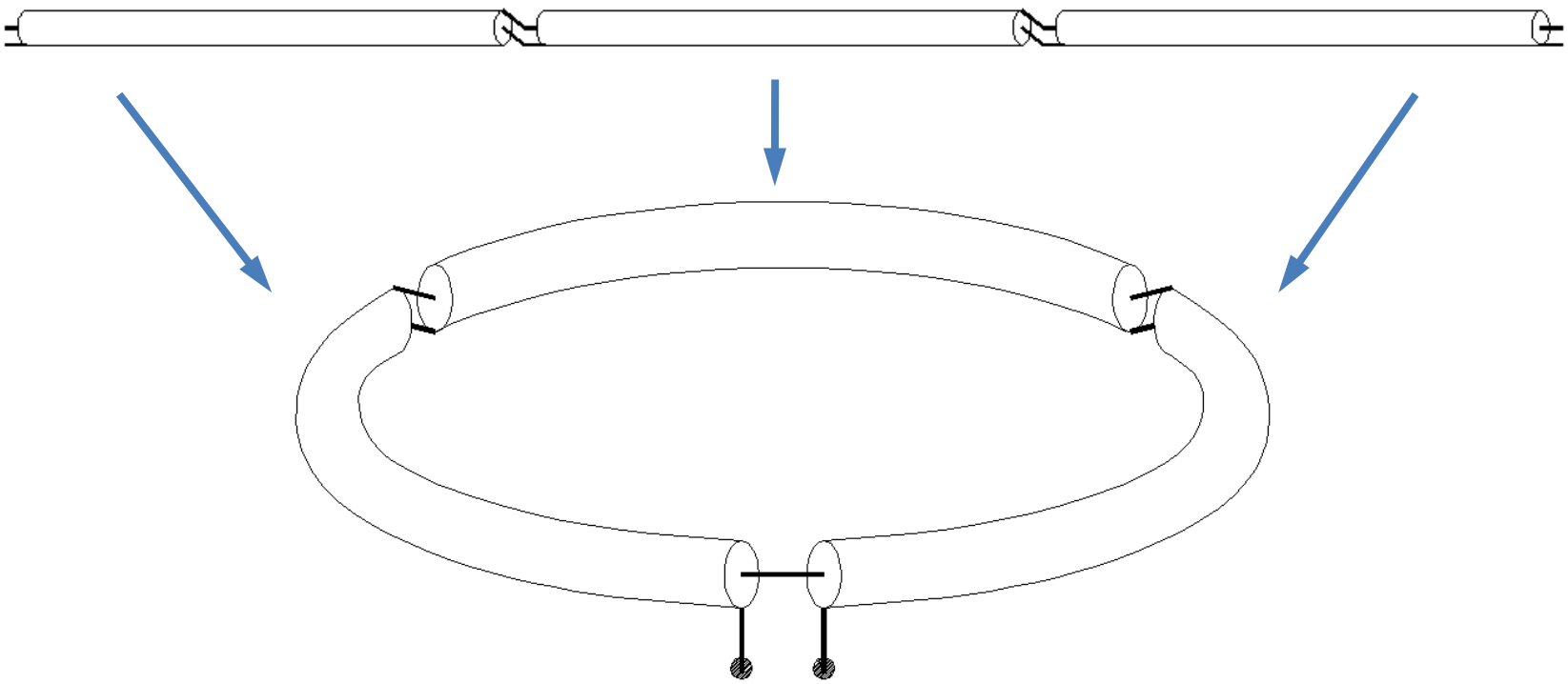

Circular Collinear Arrays
Horizontally Polarized - Omnidirectional

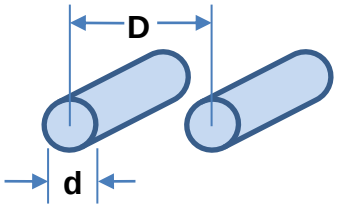
CIRCULAR ELEMENT



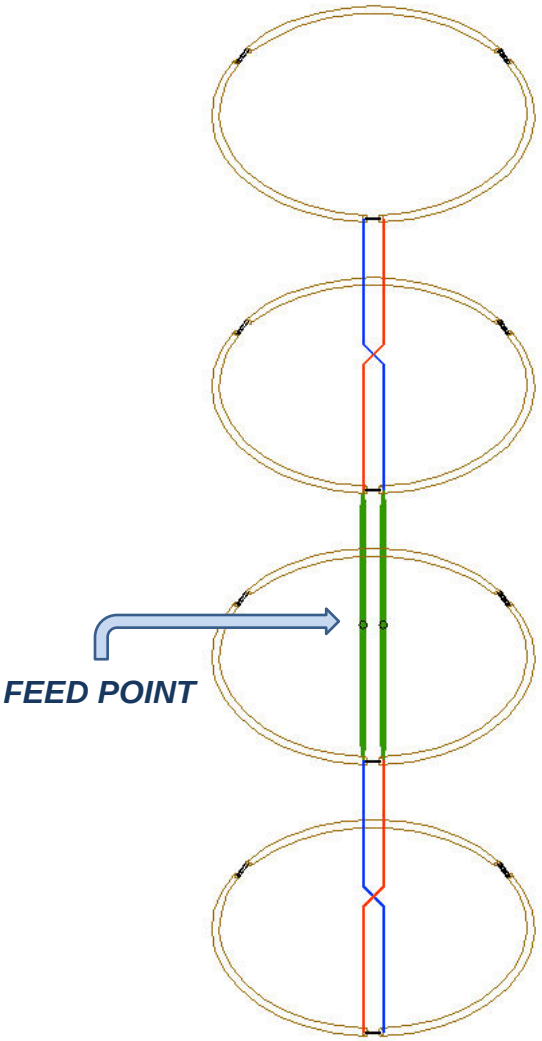
- COAXIAL COLLINEAR IS WRAPED INTO CIRCLE
- THREE $\lambda/2$ COAXIAL ELEMENTS PER TURN
- RADIATION PATERN IS SIMILAR TO A “BIG WHEEL”
- SINGLE SIDE FEED IS MUCH SIMPLER THAN 3 RADIAL FEEDS

ARRAYS OF CIRCULAR ELEMENTS

- Arrays of stacked wheels
- Wheel elements are fed with open wire lines
- Impedance control of open wire lines provide equal load sharing

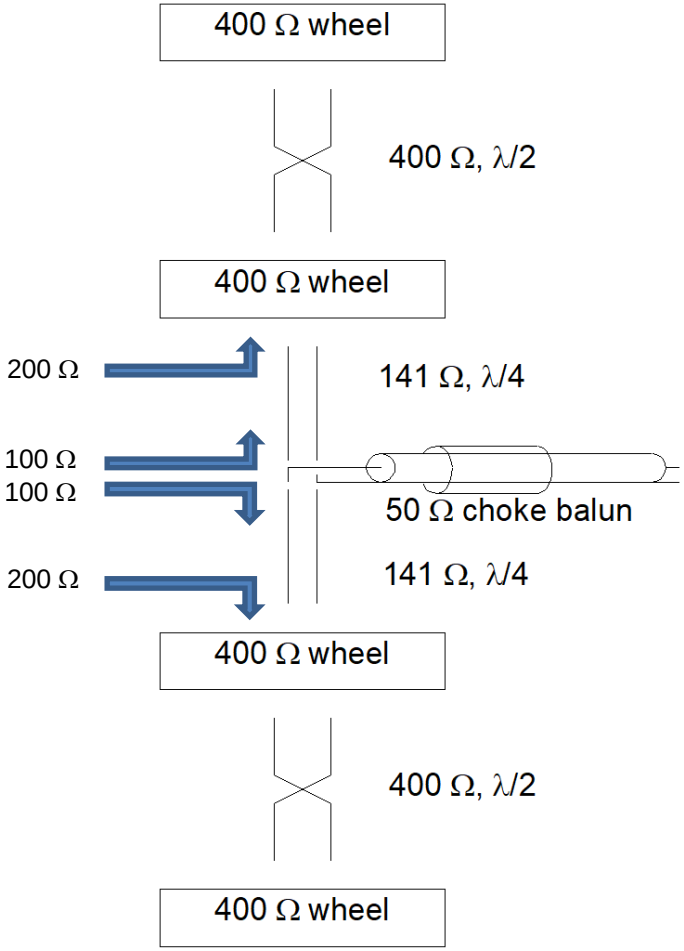


$$Zo = 120\ cosh^{-1}\left(\frac{D}{d}\right)$$



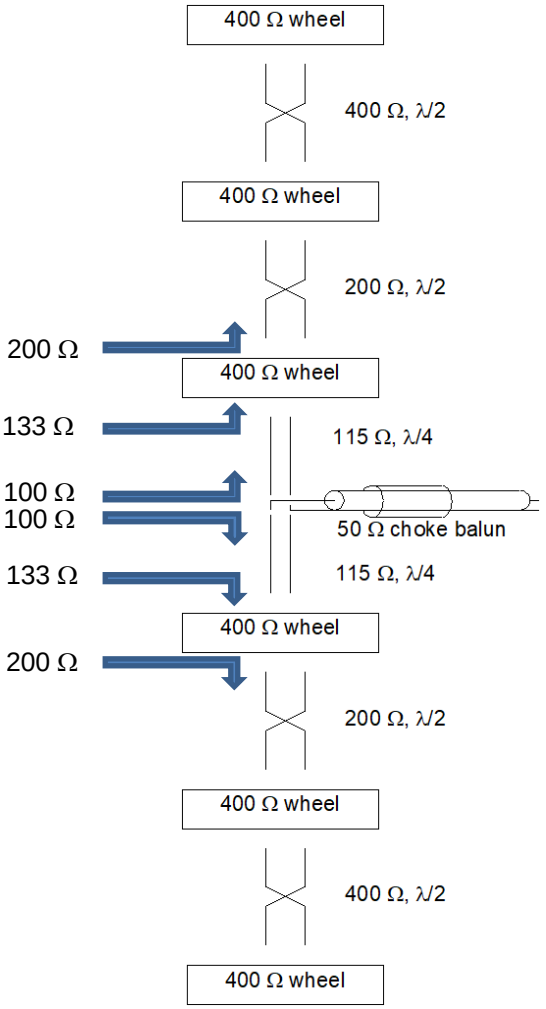
FEEDING THE FOUR WHEEL ARRAY

- Collinear connected RG-316 segments form wheels
- Driving point Z of wheel is approximately 400 Ω
- Four wheel elements stacked
- All elements are spaced λ/2
- Open wire feed line provide equal load sharing
- Impedance control of open wire line is important

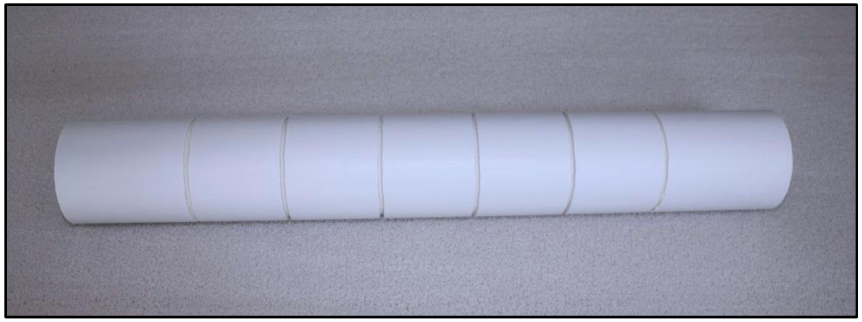


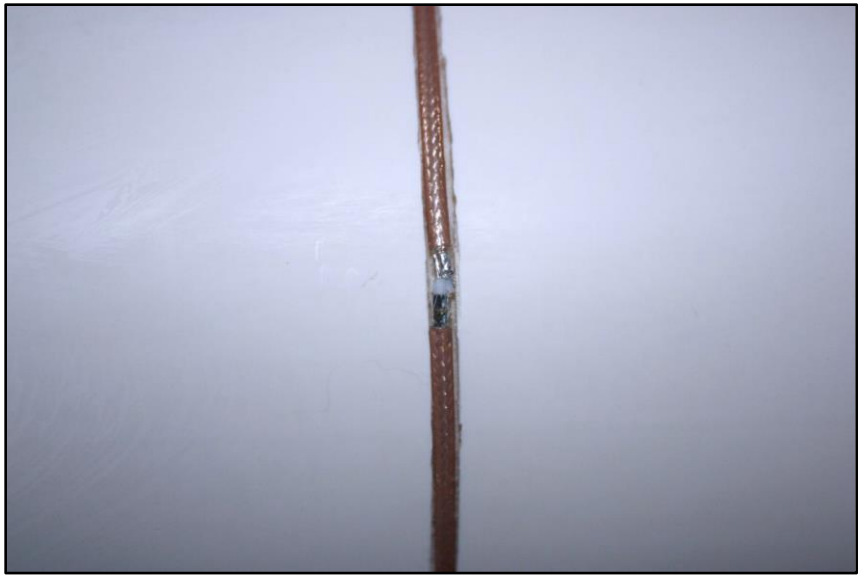
FEEDING THE SIX WHEEL ARRAY

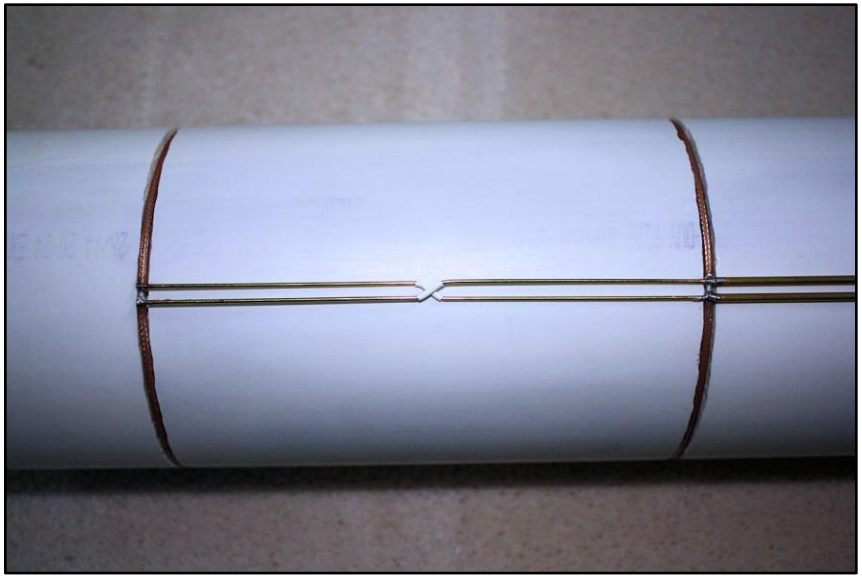
- Collinear connected RG-316 segments form wheels
- Driving point Z of wheel is approximately 400 Ω
- Six wheel elements stacked
- All elements are spaced λ/2
- Open wire feed line provide equal load sharing
- Impedance control of open wire line is important



ARRAY CONSTRUCTION PHOTOS



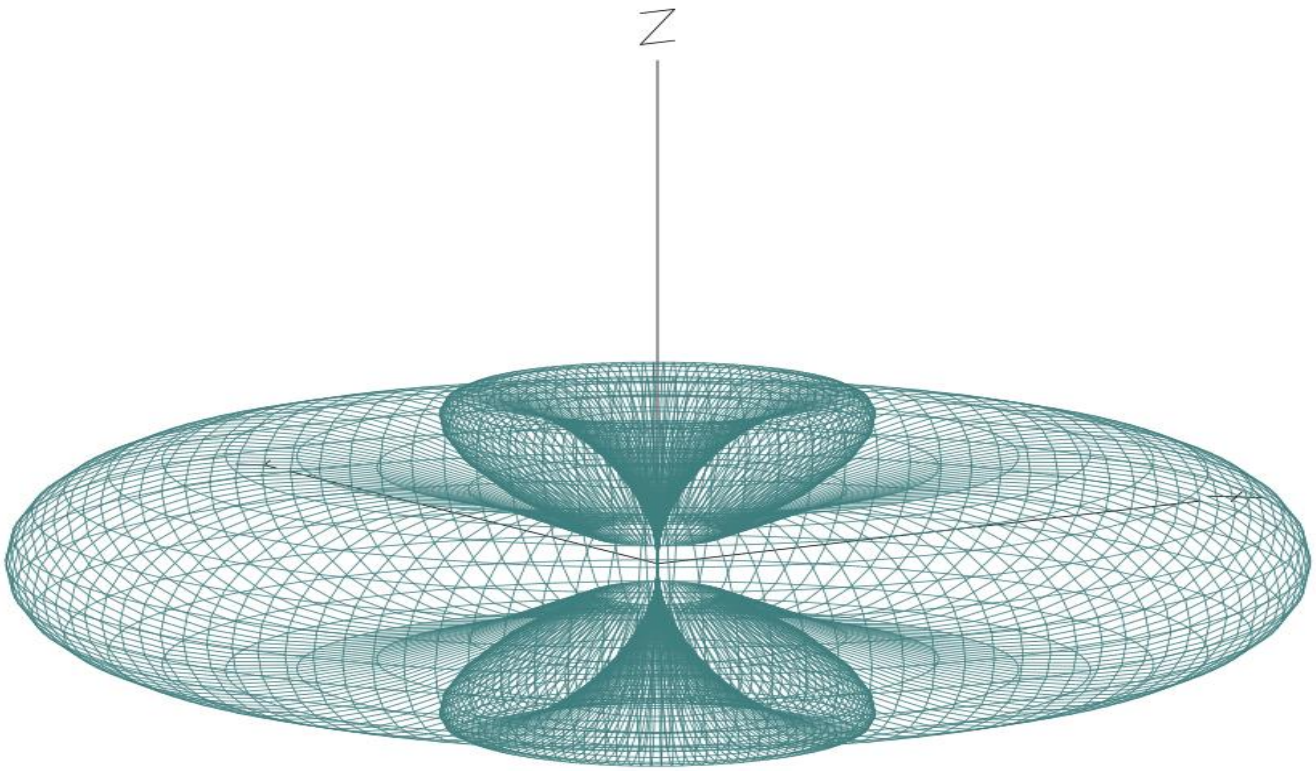




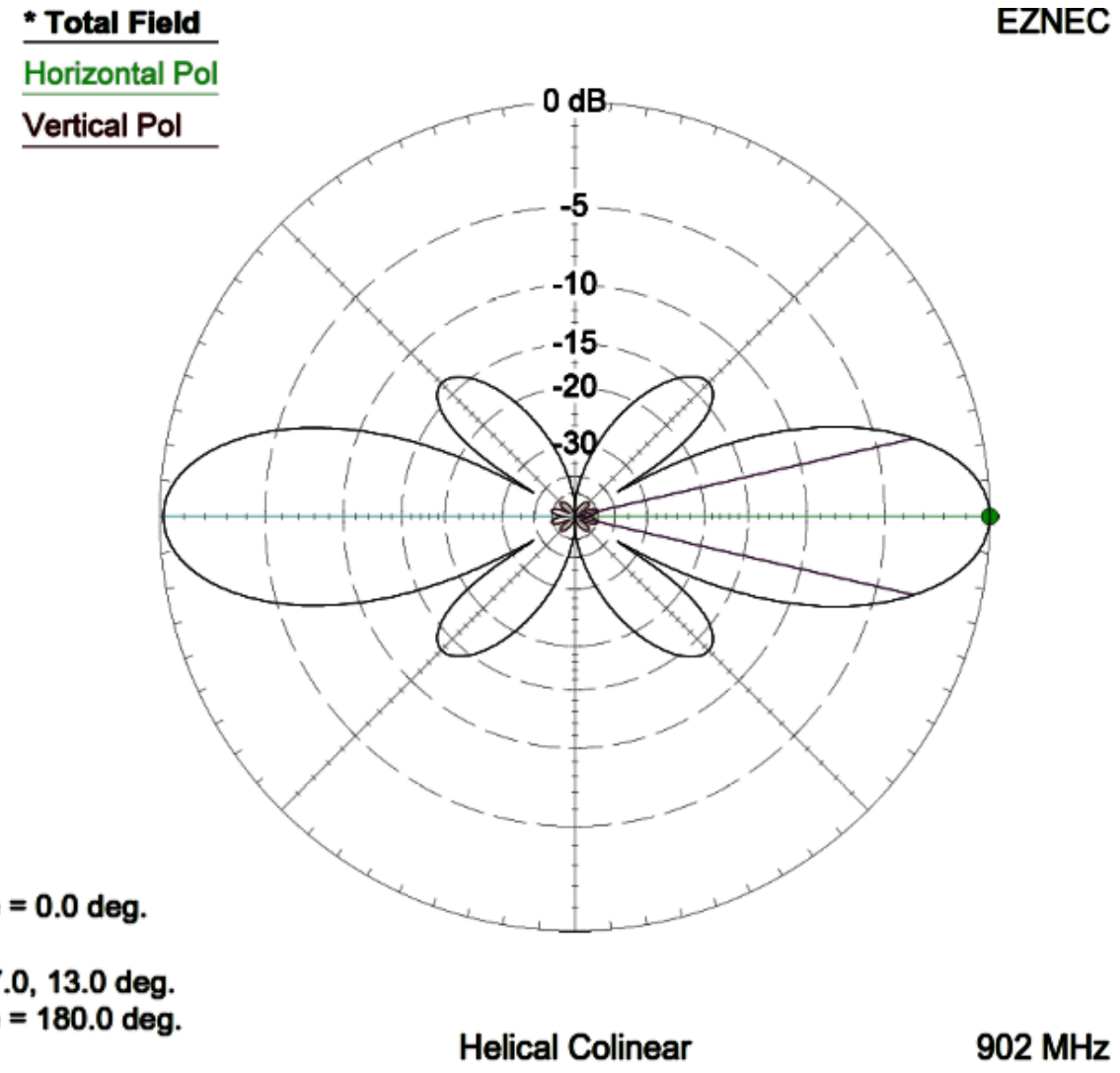
1296 MHz – SIX WHEEL ARRAY

3D RADIATION PATTERN – 4 WHEEL ARRAY

EZNEC

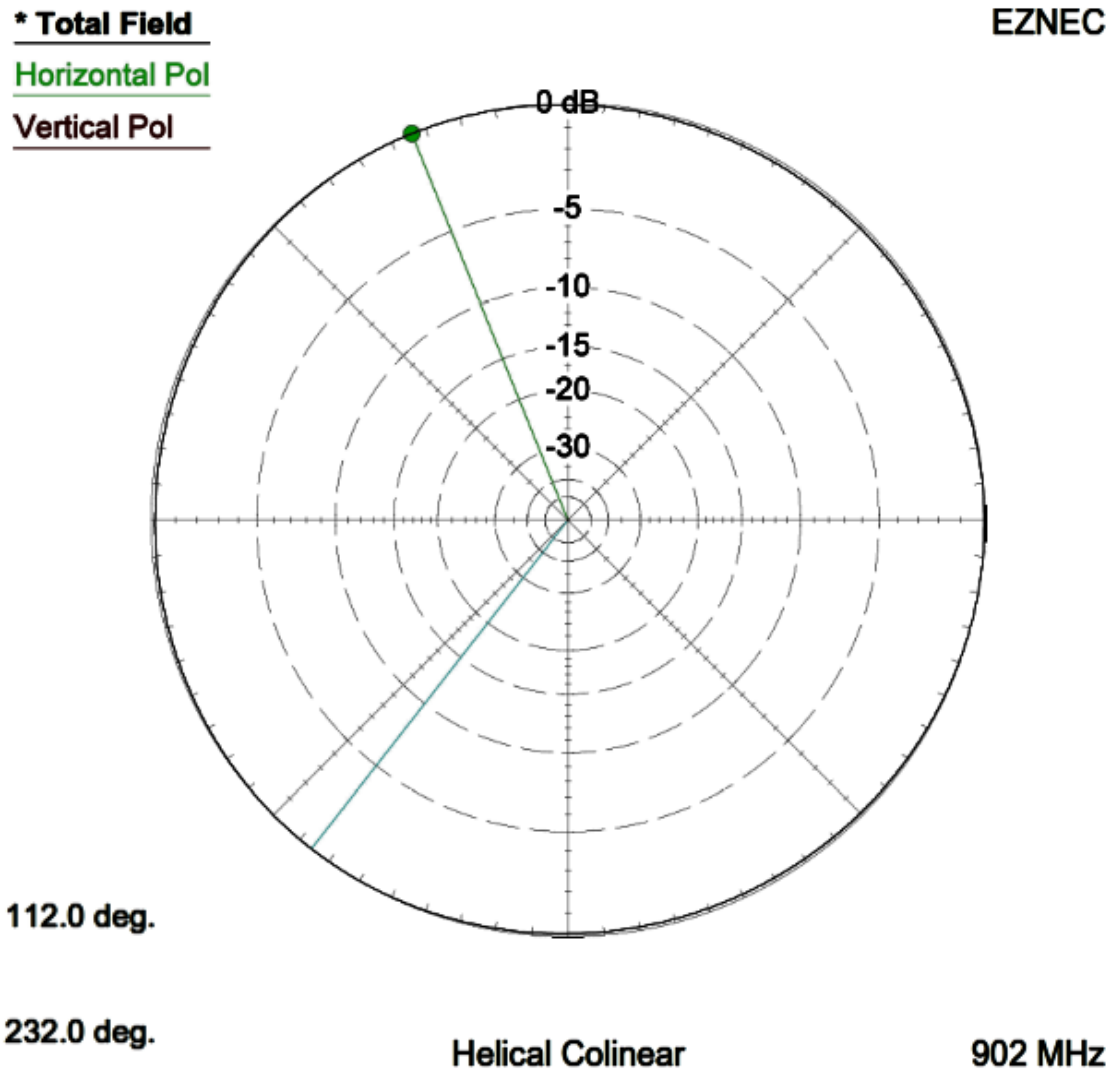


FOUR WHEEL ELEVATION PATERN

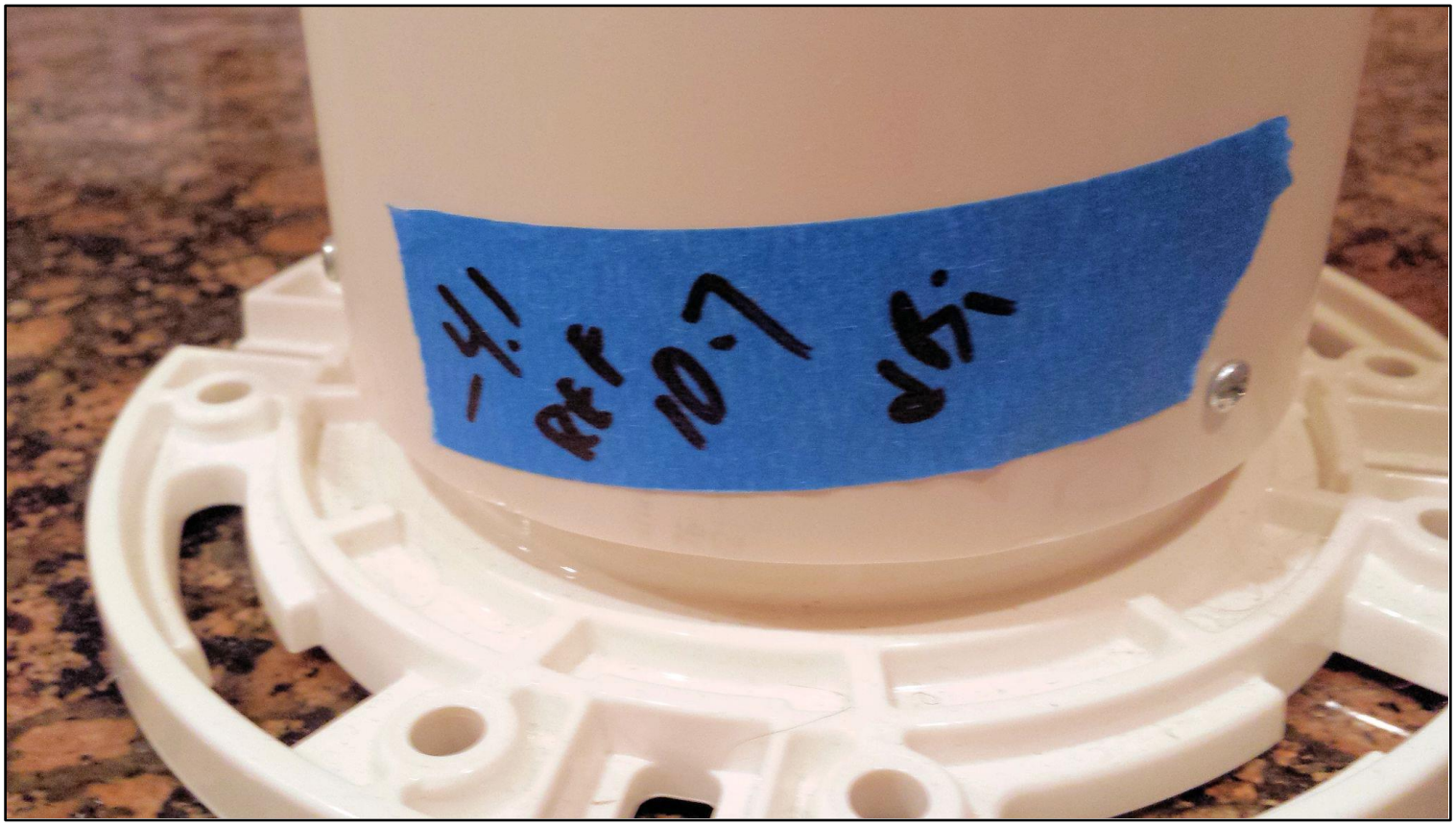


Elevation Plot	
Azimuth Angle	0.0 deg.
Outer Ring	6.28 dBi
Slice Max Gain	6.28 dBi @ Elev Angle = 0.0 deg.
Front/Back	0.14 dB
Beamwidth	26.0 deg.; -3dB @ 347.0, 13.0 deg.
Sidelobe Gain	6.14 dBi @ Elev Angle = 180.0 deg.
Front/Sidelobe	0.14 dB

FOUR WHEEL AZIMUTH PATERN

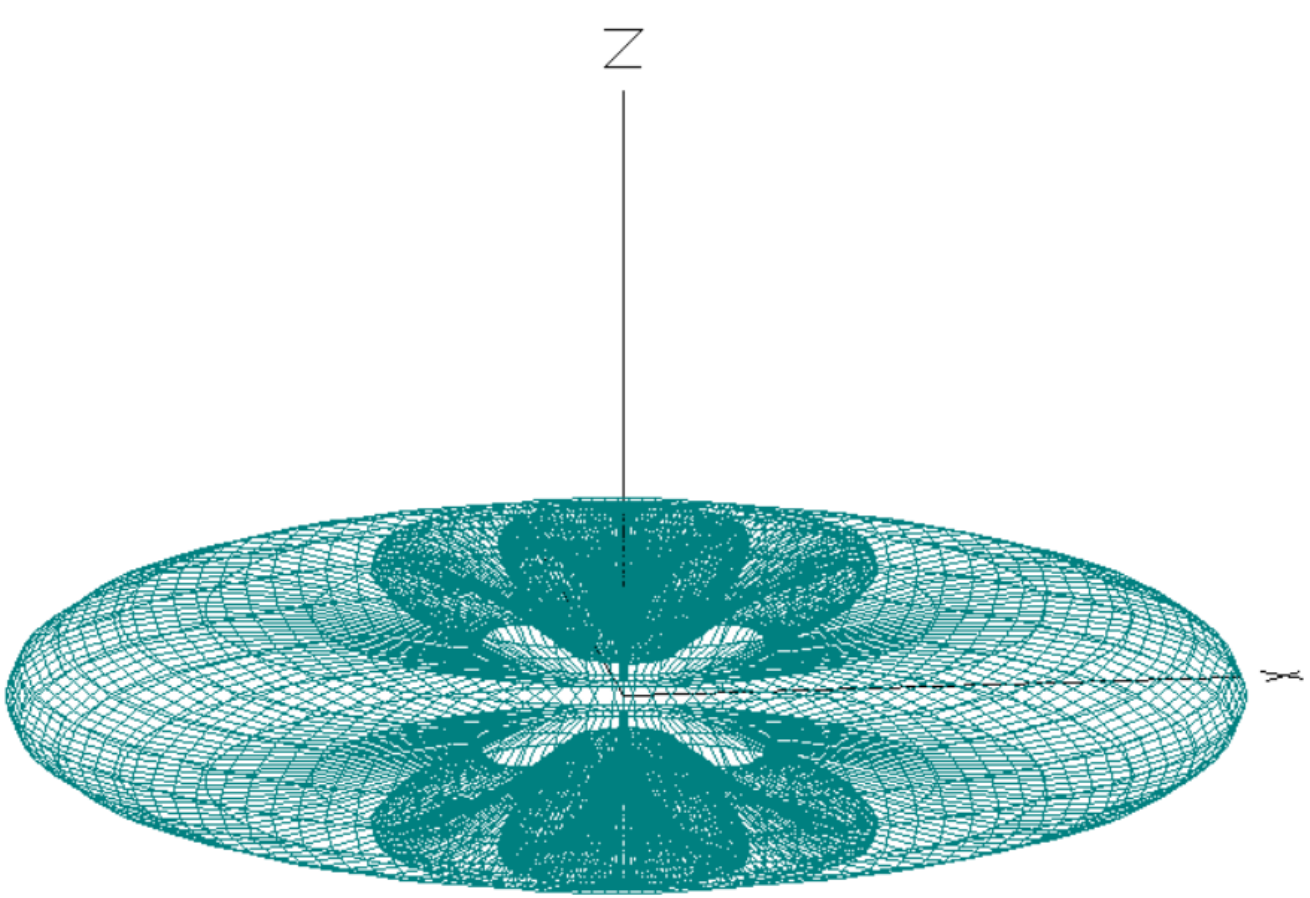


2014 CSVHFS ANTENNA RANGE MEASUREMENT

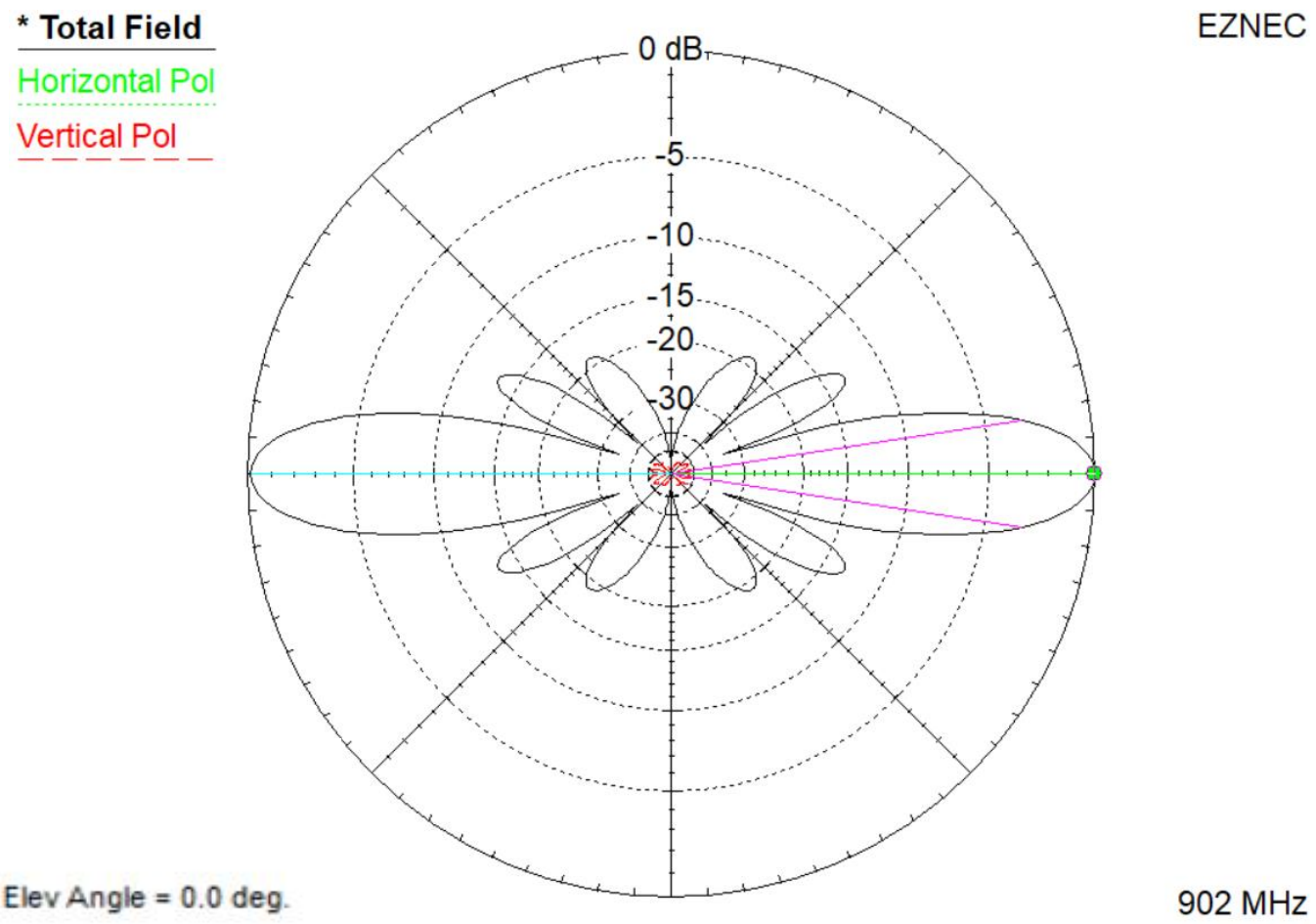


FOUR WHEEL ARRAY: 10.7 - 4.1 = 6.6 dBi GAIN

3D RADIATION PATTERN – 6 WHEEL ARRAY



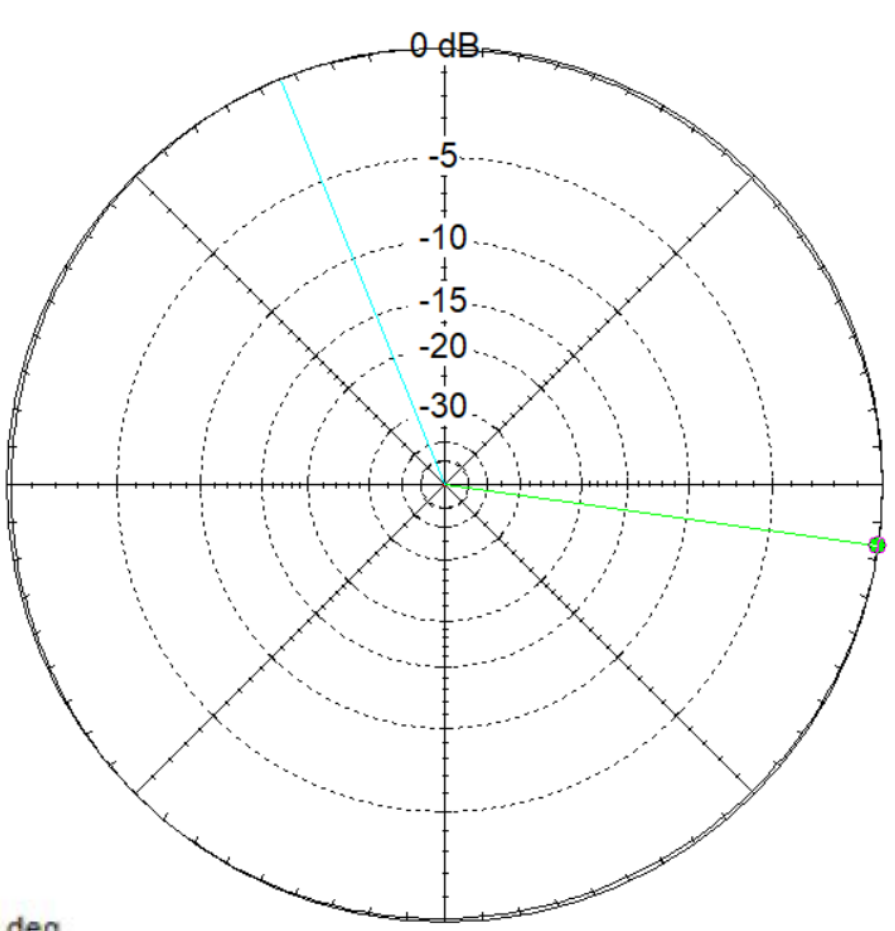
SIX WHEEL ELEVATION PATERN



Elevation Plot
Azimuth Angle 0.0 deg.
Outer Ring 7.96 dBi

Slice Max Gain 7.96 dBi @ Elev Angle = 0.0 deg.
Front/Back 0.15 dB
Beamwidth 17.2 deg.; -3dB @ 351.4, 8.6 deg.
Sidelobe Gain 7.81 dBi @ Elev Angle = 180.0 deg.
Front/Sidelobe 0.15 dB

SIX WHEEL AZIMUTH PATERN



Azimuth Plot
Elevation Angle 0.0 deg.
Outer Ring 7.96 dBi

Slice Max Gain 7.96 dBi @ Az Angle = 352.0 deg.
Front/Back 0.16 dB
Beamwidth ?
Sidelobe Gain 7.96 dBi @ Az Angle = 112.0 deg.
Front/Sidelobe 0.0 dB

Summary

- Circular elements
- Three λ/2 coaxial collinear segments in circle
- “Big Wheel” radiation pattern
- Single feed point
- Elements spaced λ/2
- Array of elements fed with open wire line
- Impedance control of open wire line controls element drive distribution
- Good results on air

23CM 6-WHEEL and 33CM 4-WHEEL ARRAYS