A HORIZONTAL POLARIZED HIGH GAIN OMNI-DIRECTIONAL ANTENNA

K5TRA

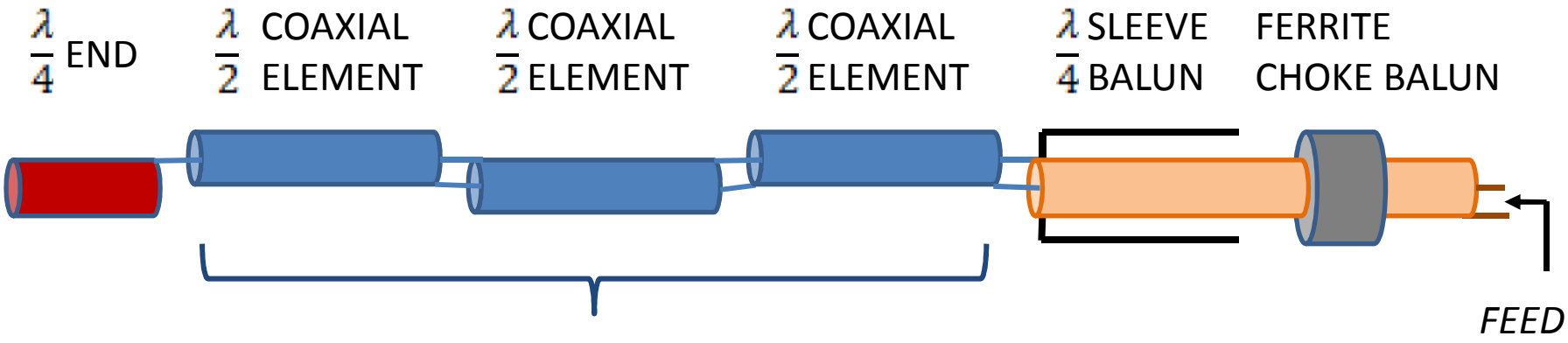
BACKGROUND

- HIGH GAIN OMNIDIRECTIONAL ANTENNAS ARE MORE DIFFICULT WITH HORIZONTAL POLARIZATION
- GOOD UNIT STRUCTURES TO STACK ARE WHEELS:
  - "BIG WHEEL" (THREE $\lambda/2$ DIPOLES IN CIRCULAR ARRAY)
  - "SUPER WHEEL" (THREE $\lambda/2$ FOLDED DIPOLES IN CIRCULAR ARRAY)
- STACKING OF UNIT STRUCTURES BRINGS COMPLEXITY IN FEEDING MANY ELEMENTS
- VERTICAL POLARIZED COLINEAR ARRAYS ARE MUCH EASIER TO FEED

THE IDEA

- WRAP $\lambda/2$ COLINEAR ELEMENTS IN A HELIX TO APPROXIMATE THE CIRCULAR ARRAY COMPRISED IN UNIT WHEEL STRUCTURES (3 ELEMENTS PER TURN)
- ONE OF THE KEY DESIGN PARAMETERS IS THE TURN-TO-TURN PITCH OF THE HELIX
- PITCH SHOULD BE SET BETWEEN $\lambda/4$ and $\lambda/2$
- LARGE PITCH TRADES GAIN AND POLARIZATION

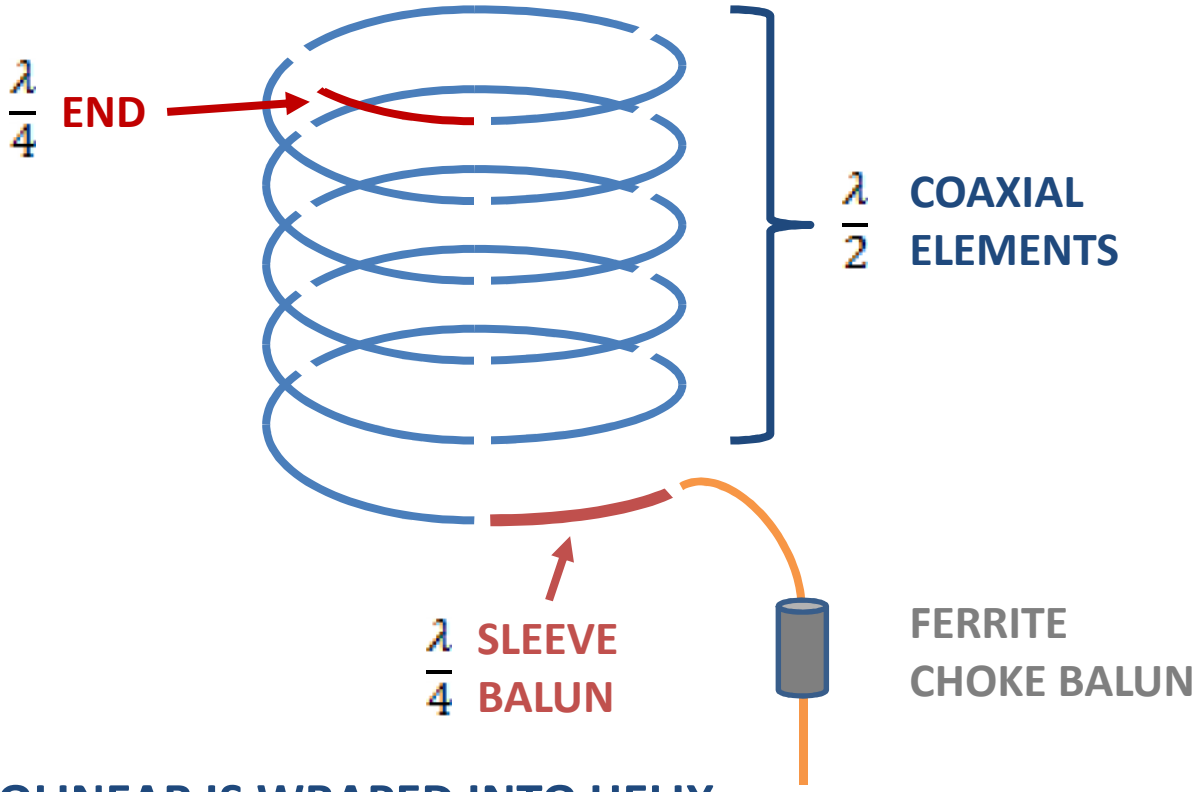
Coaxial Colinear Structure



THREE ELEMENTS ARE SHOWN HERE
SIMPLY TO ILLUSTRATE THE STRUCTURE
OVERALL GAIN IS DETERMINED BY
NUMBER OF λ/2 COAXIAL ELEMENTS

- **λ/4 END ELEMENT AND λ/4 SLEEVE ARE FREE SPACE LENGTHS**
- **λ/2 COAXIAL ELEMENTS ARE IN MEDIA LENGTHS**
- **CHOKE BALUN IS OPTIONAL**
- **BEST POSITION FOR CHOKE BALUN IS λ/4 BELOW OPEN END OF SLEEVE**

Helical Colinear Structure

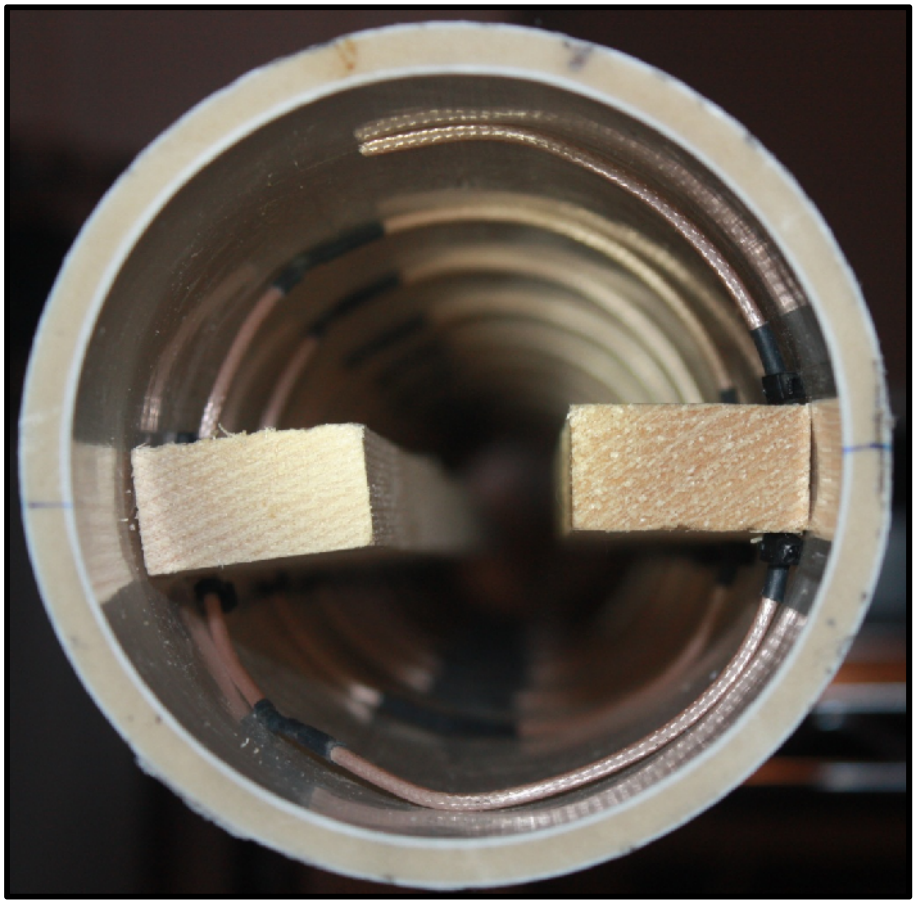


- COAXIAL COLINEAR IS WRAPED INTO HELIX
- THREE λ/2 COAXIAL ELEMENTS PER TURN
- EACH TURN IS SIMILAR TO A "BIG WHEEL"
- COAXIAL FEED IS MUCH EASIER THAN FEEDING MANY "BIG WHEELS"

RESULTS

- A PROTOTYPE WAS CONSTRUCTED FOR 902 MHz SSB
- DETAILS:
  - **RG316 $\lambda/2$ ELEMENTS (32)**
  - **PITCH $\approx$ 4.85”**
  - **4” PVC RADOME**
  - **TOTAL TURNS = 11 (INCLUCING $\lambda/4$ END SEGMENTS)**
- GAIN $\approx$ 10.5 dBd
- EASY CONSTRUCTION

PROTOTYPE 902 MHz ANTENNA



INTERIOR VIEW OF PVC TUBE

ASSEMBLED 902 MHz PROTOTYPE