

The Cylindrical Reflector Doublet Antenna

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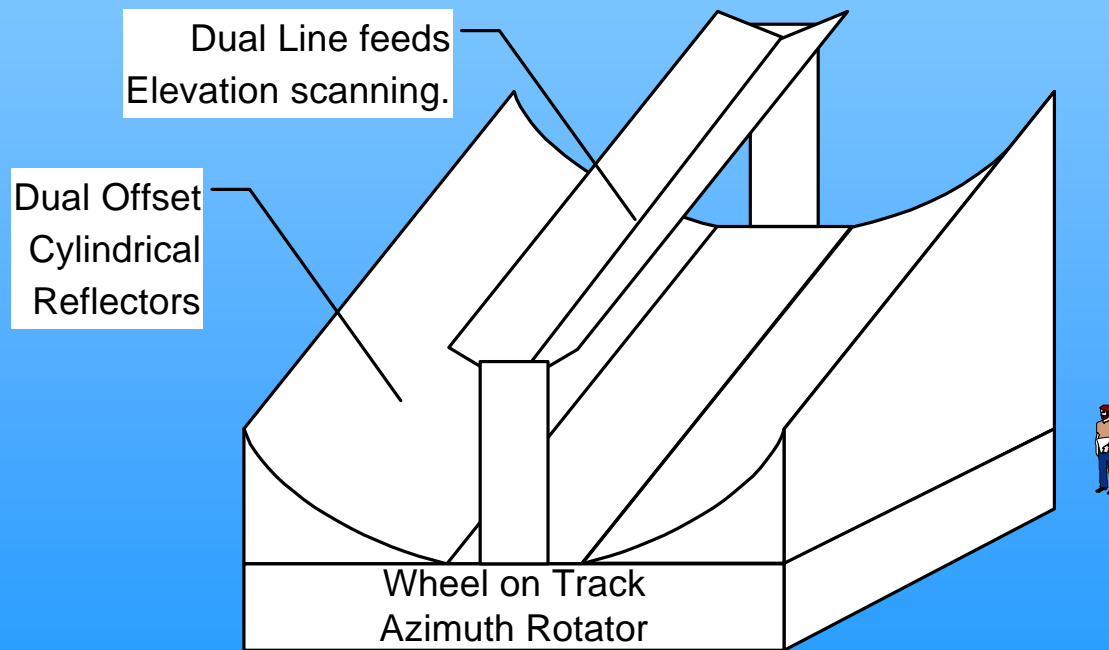
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Example of a Cylindrical Reflector Doublet Antenna



Operational Advantages

- MULTIBEAMING
 - Elevation multi beam forming with array line feeds
 - Limited multiple beams in azimuth using several offset line feeds
- ADAPTIVE NULL STEERING
 - Quality of cancellation proportion to degree of freedom
 - First line of defence against interference
 - Does not degrade T_{sys}
- POSSIBLE SINGLE UNIT ARRAY STATION
 - Collecting area of 2000m² practical



Mechanical Advantages

- **LOW COST**
 - No towers or counterweights
 - Minimal backing structure with Multipoint support
 - Ease of mechanical maintenance, main mechanical components at ground level
- **HIGH FREQUENCY SURFACE**
 - Easily achievable high surface accuracy
 - curvature in one direction
 - Easy to align surface
 - Reasonable feed costs at 10 GHz
 - No gravity deflections
- **HIGH WIND RESISTANCE**



Astronomy Advantages

- **WIDE BANDWIDTH**
CONSTANT COLLECTING AREA
 - High frequency to 10GHz and above
 - Low frequency 100MHz with 15m reflector
- **FULL SKY COVERAGE**
 - Mechanical azimuth steering
 - Electronic scanning zenith to horizon
- **DUAL POLARISATION** with good purity



Astronomy Advantages

- HIGH SURFACE BRIGHTNESS SENSITIVITY
 - Due to reduced shadowing,
 - antenna has low and constant profile, does not tilt
 - antennas can be closer together more than doubles surface brightness sensitivity
 - Inter line feed correlation
 - high isolation between line feeds
 - Allows cross correlations baselines 5 to 70m



Limitations? - not really

- LIMITED INSTANTANEOUS SKY VISIBILITY
 - But necessary for high frequency operation to limit feed numbers
 - Still have large Field-of-View but not whole sky
 - Instantaneous multiple beams possible over part sky. Up to 1000 deg²



Limitations? - not really

- **LARGE, MOVING PHYSICAL STRUCTURE**
 - Must have movement for full sky visibility
 - If high frequency operation desired
 - This design reduces movement to single Azimuth drive
 - No other option simpler except phased arrays
 - Azimuth drive is the lowest cost option



Doublet Antenna

- Offers large FOV hence high astronomy throughput
- High frequency operation
- High surface brightness sensitivity
- Mechanical structure low cost and robust
- Viable technology now because cost of beamformer has become affordable
- Only technical challenge - line feeds

