Issues with the use of telescopes

Long wavelength (Radio) Astronomy

Resolution Revisited

Radio telescopes have relatively poor ability to resolve objects because of the long wavelength of the EM waves.

Issues with the use of telescopes

Resolution

$$\theta_{min}\ \text{(in arc sec)} = .25\ \frac{\lambda\ \text{(in } \mu m\text{)}}{D\ \text{(in m)}}$$

For the National Radio Astronomical Observatory Robert C. Byrd Radio Telescope,

wavelength ≈ 1 m = 1×10^6 μm

Diameter of the aperture (the objective) = 100 m

$$\theta_{min} \approx 2500'' = 41' = .69^{o}$$

The angular diameter of the moon = 30'

The angular diameter of the Andromeda Galaxy ≈ 178'

The NRAO telescope would be able (roughly) to resolve radio sources of these angular diameters

This is the worlds largest fully steerable radio telescope

Issues with the use of telescopes

Long wavelength (Radio) Astronomy

Interferometry

Solution: Use multiple radio telescopes separated by a large distance.

The separation between the telescopes is called the baseline.

Signals are then collected from the two sources and then combined. In effect, the separated telescopes increase the effective diameter of the objective.

The process of combining the signals from two (or more) receivers is called ***interferometry***.