

# Az El Mount Exposure Time

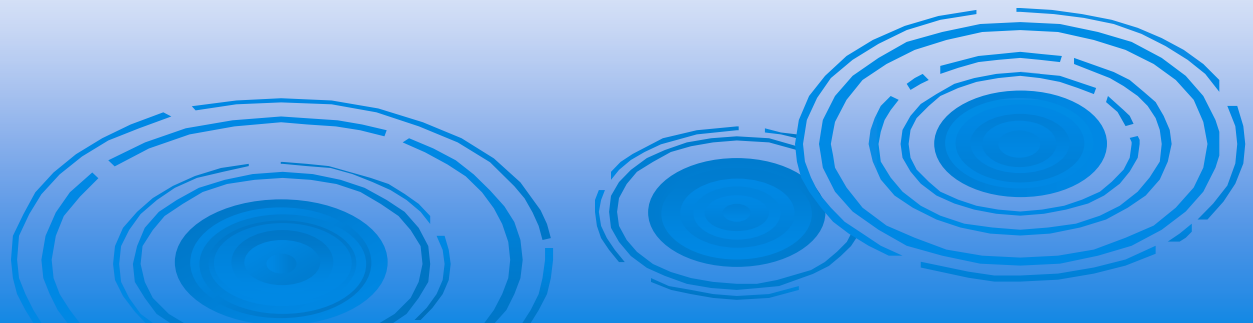
Shef Robotham

Litchfield Hills Amateur Astronomy  
Club



# Azimuth/Elevation Mount Exposure Time

- Interested in Astro Imaging with AzEI mount
  - Quick and Easy Set-up !
  - No Polar Alignment !
- Requires Good AzEI Tracking
  - Mount 'Trained'
  - AzEI 'PEC'

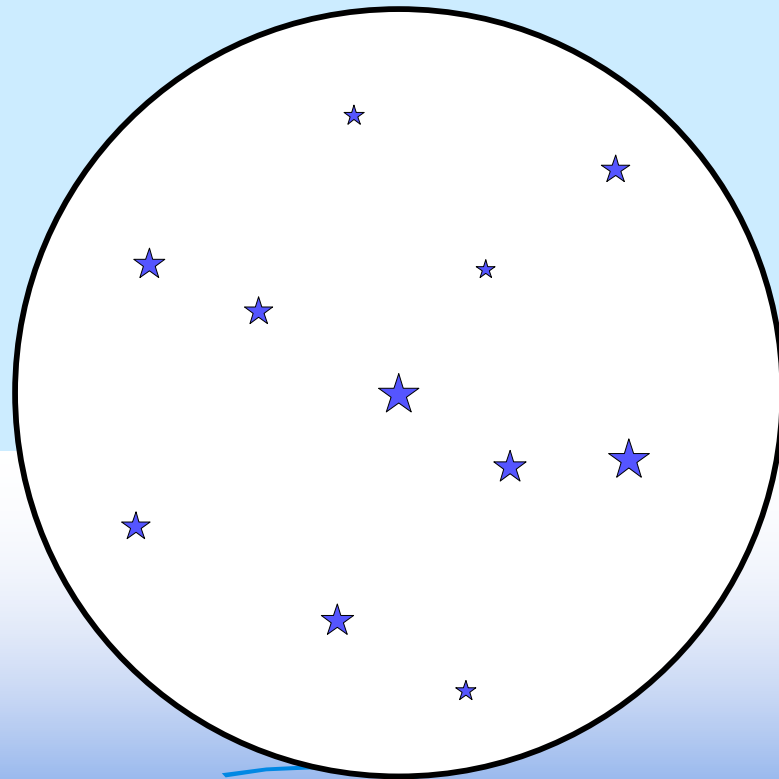


# Preliminary Calculations Requirements

- Camera Sensor Dimensions
  - H,W and Pixel Size
- Diffraction Limited Spot Size for Scope Configuration
  - Telecompressor
  - Barlow
- Match Diffraction Limited Spot Size to CCD Pixel Size
  - Degree of Binning



# Simulated Eyepiece View

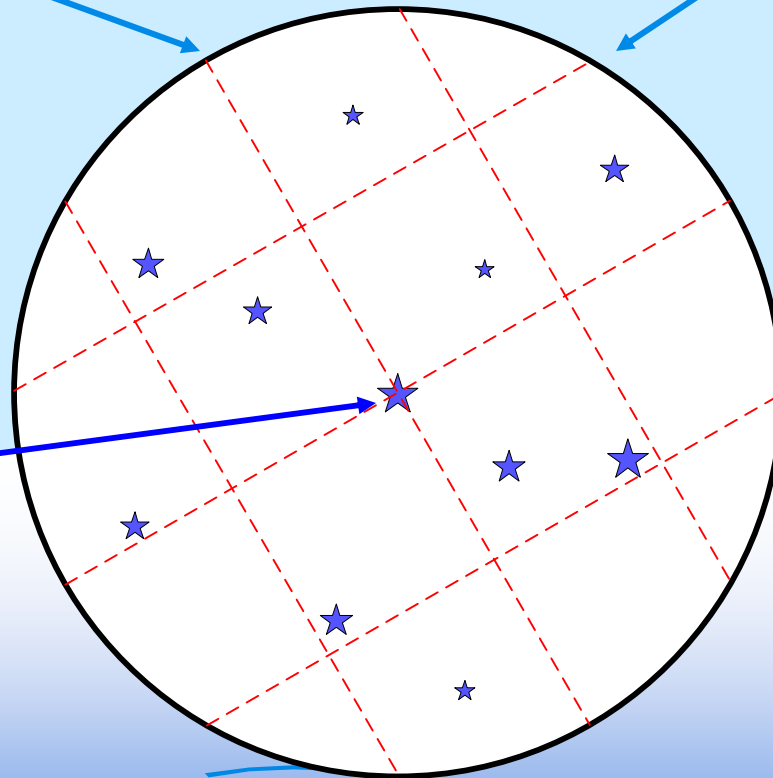


# RA/Dec Eyepiece View

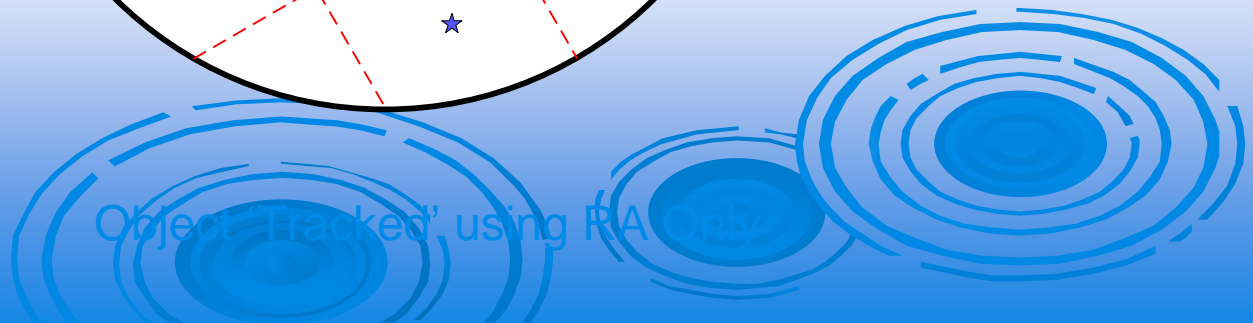
Lines of Right Ascension

Lines of Declination

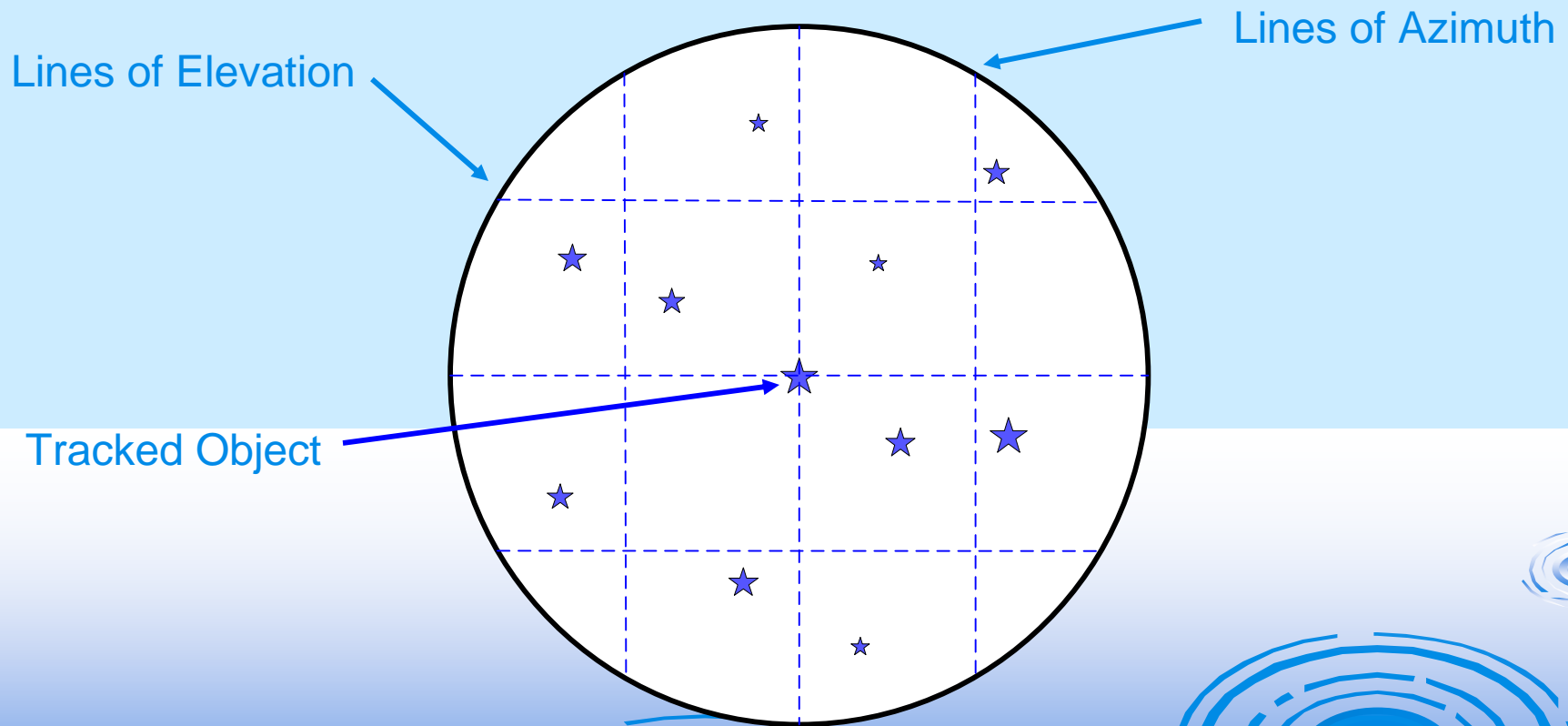
Tracked Object



Object 'tracked' using RA Only

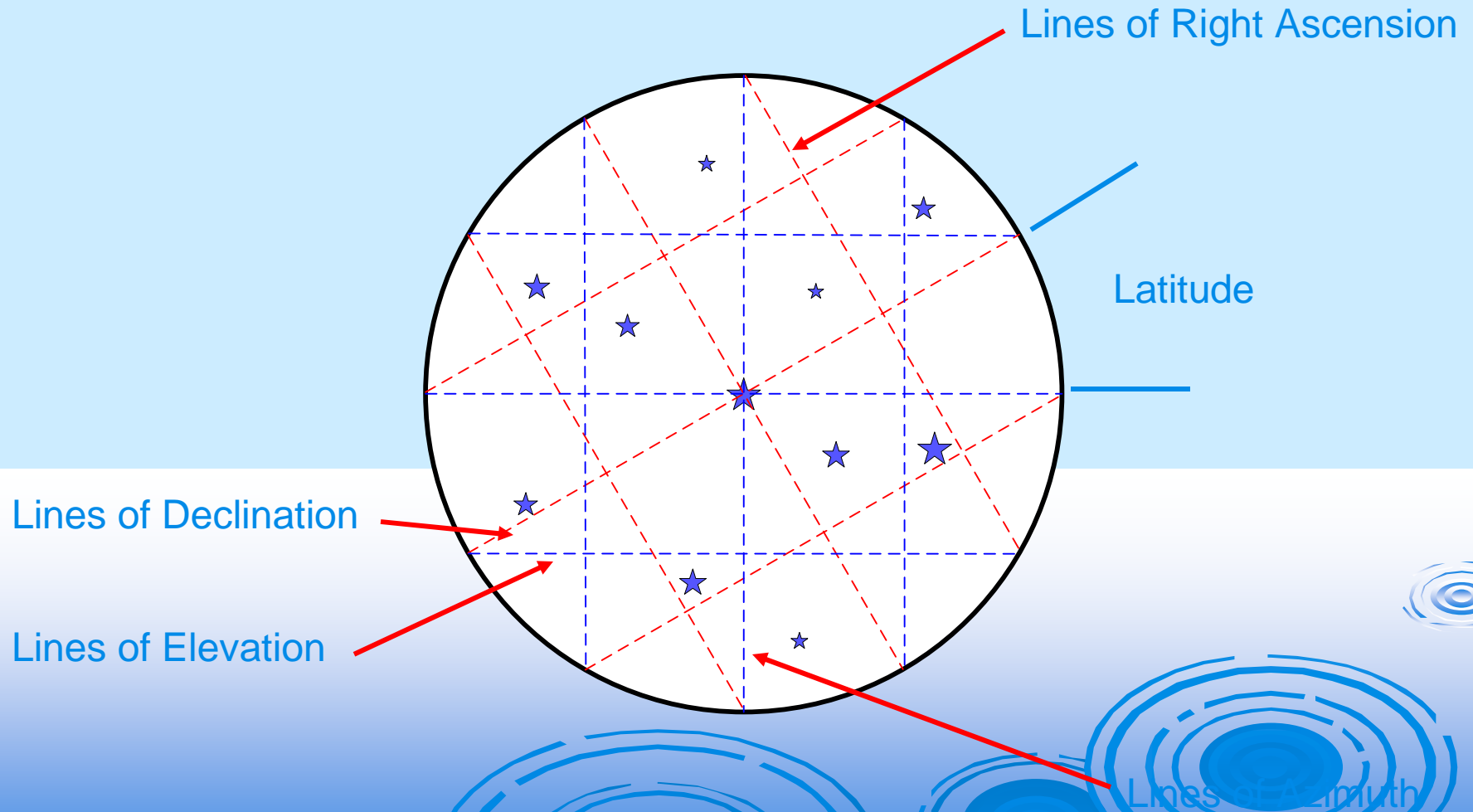


# Az/EI Eyepiece View

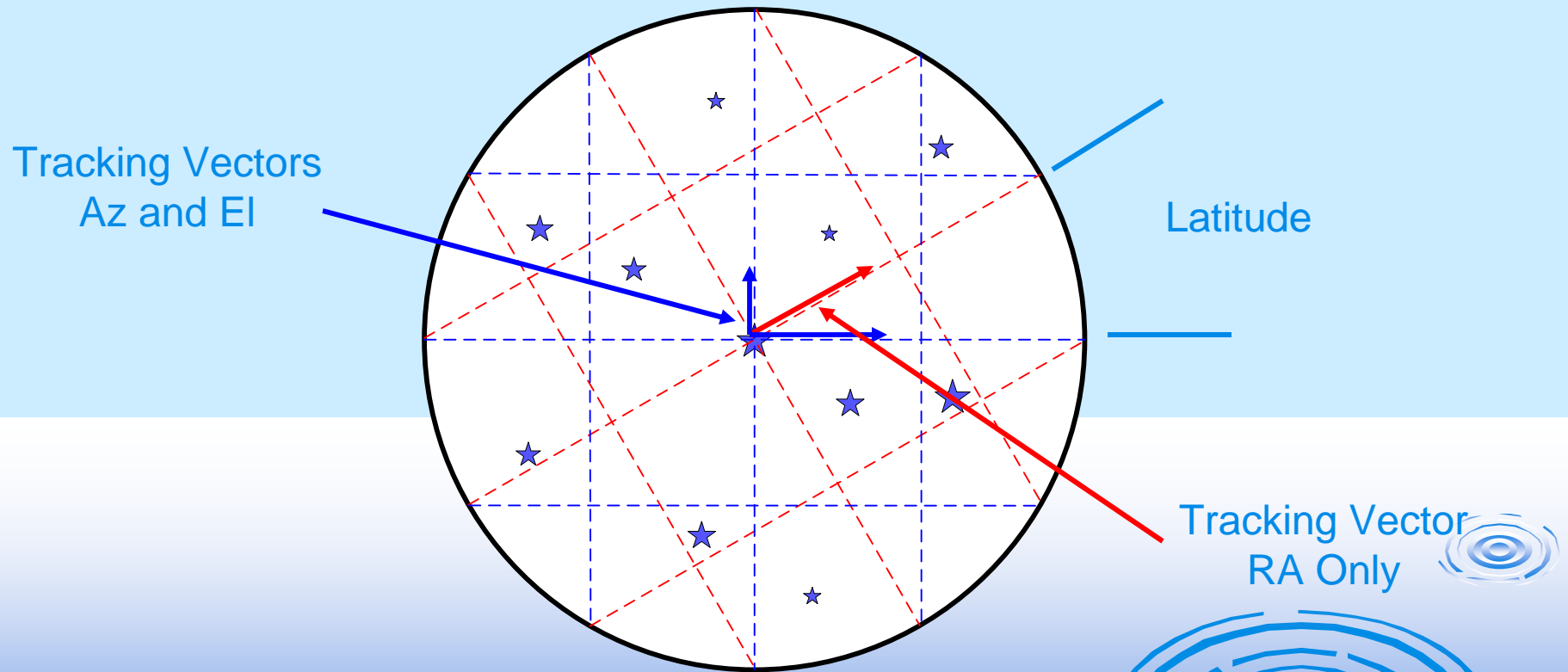


Object 'Tracked' with both Azimuth and Elevation Simultaneously

# Ra/Dec and Az/EI Reticle



# Tracking Vectors



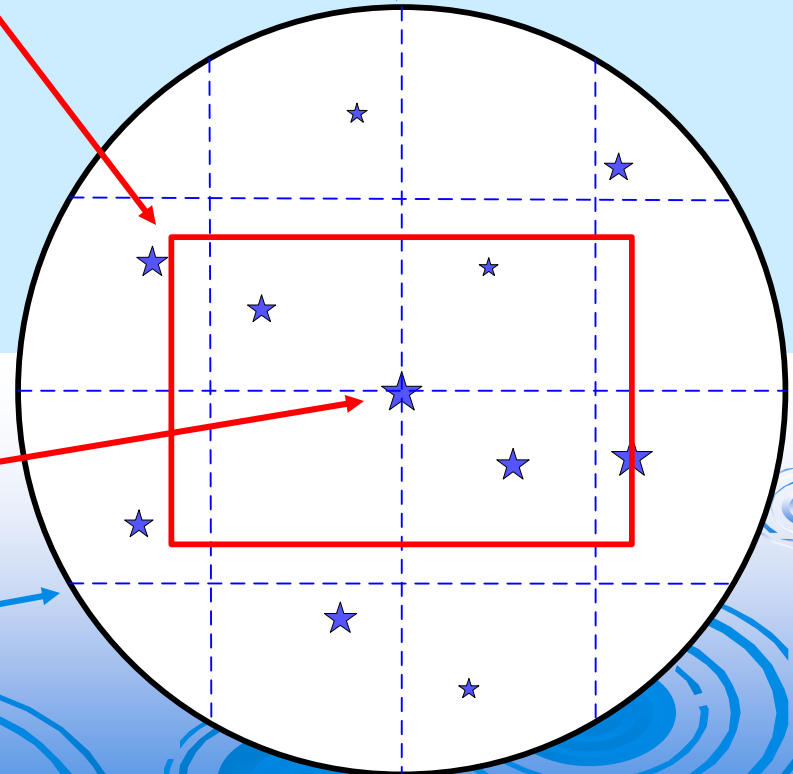


# Specific Field of View



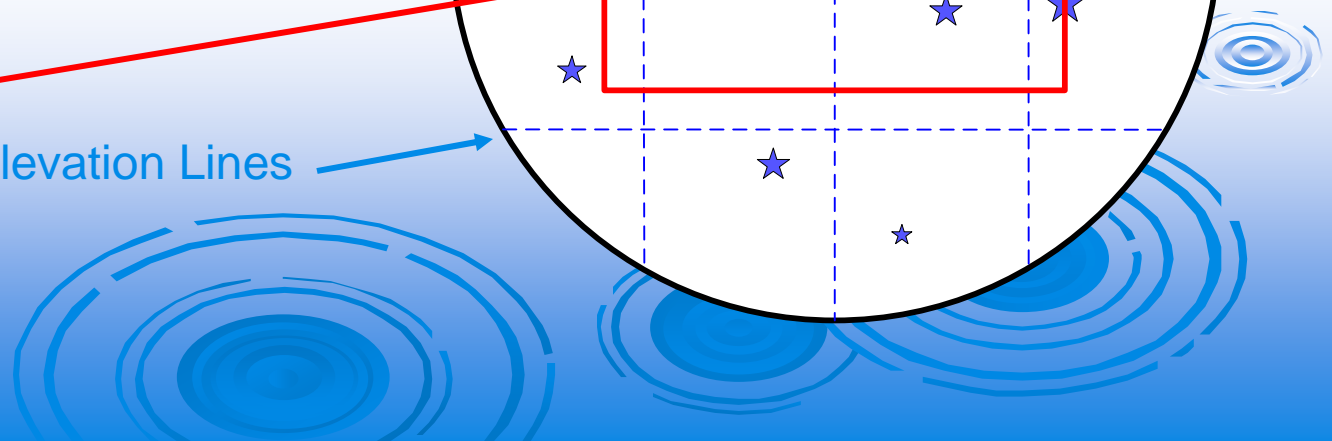
Camera FOV

Azimuth Lines

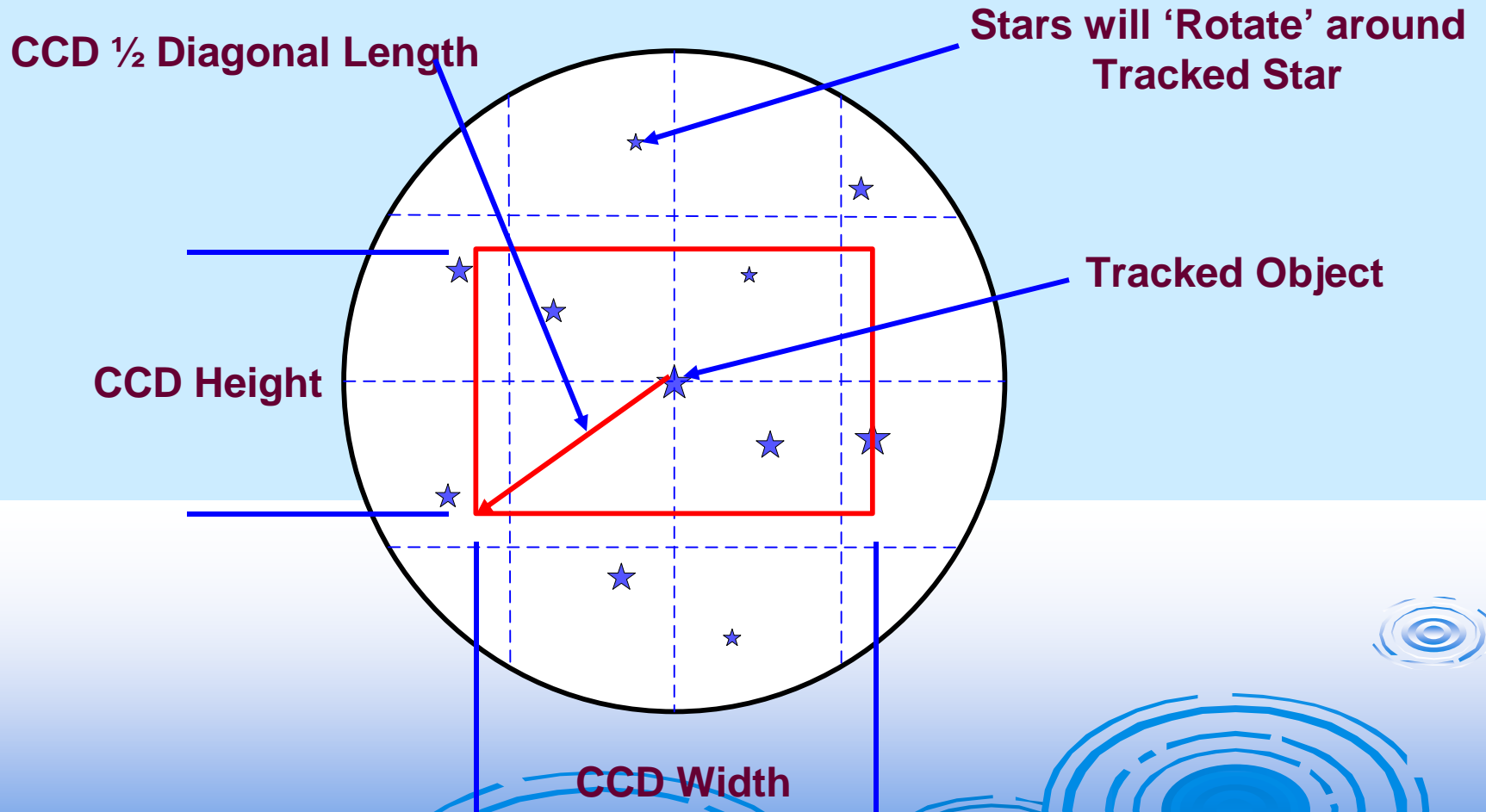


Tracked Object

Elevation Lines



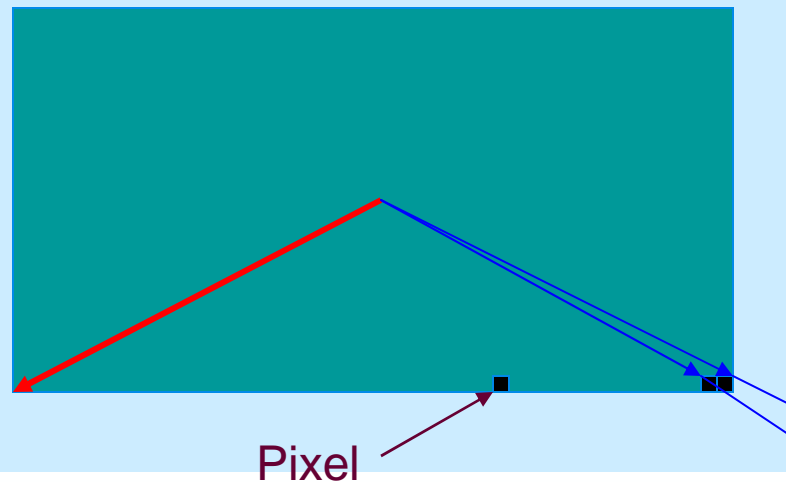
# Field of View Dynamics



$$CCD \text{ Diagonal} = [(H^2 + W^2)^{.5}] / 2$$

# CCD Sensor Array

Peripheral Stars Rotate  $360^\circ/24$  Hours or  
15 arc sec/sec.



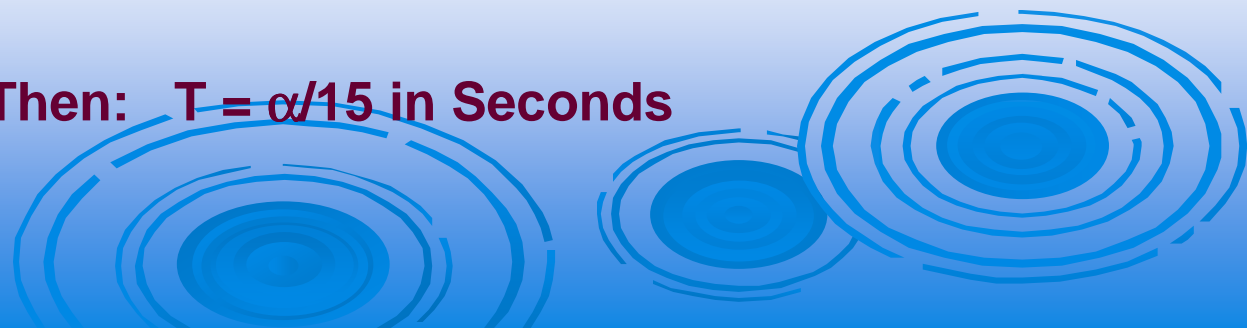
Angle Formed by 2 Adjacent  
Pixels and Sensor Diagonal

"Pixel Size" includes Binning

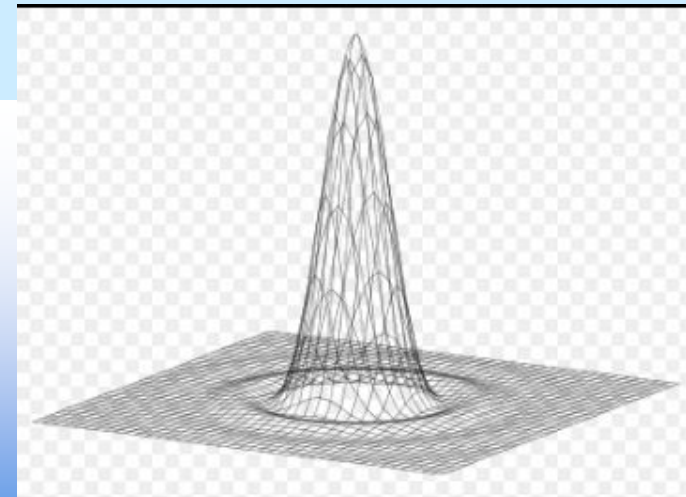
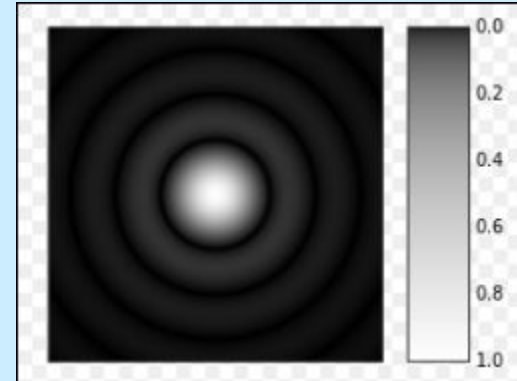
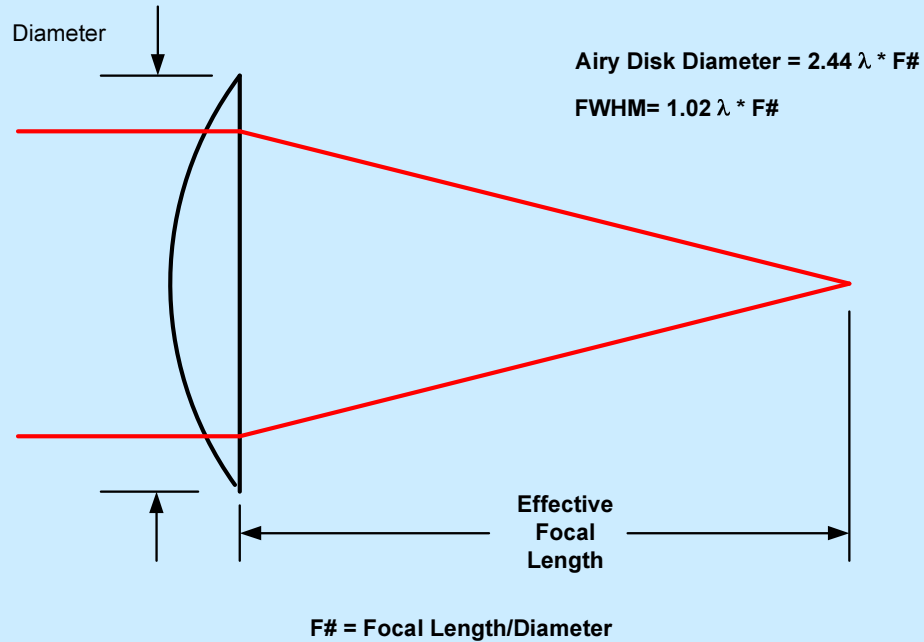
Using the Sensor  
Diagonal, instead will  
result in NO Star Trails.

$$\alpha = 3600 * \arcsin((2 * \text{Pixel Size}) / \text{Array Diagonal})$$

Then:  $T = \alpha / 15$  in Seconds



# Diffraction Spot Size

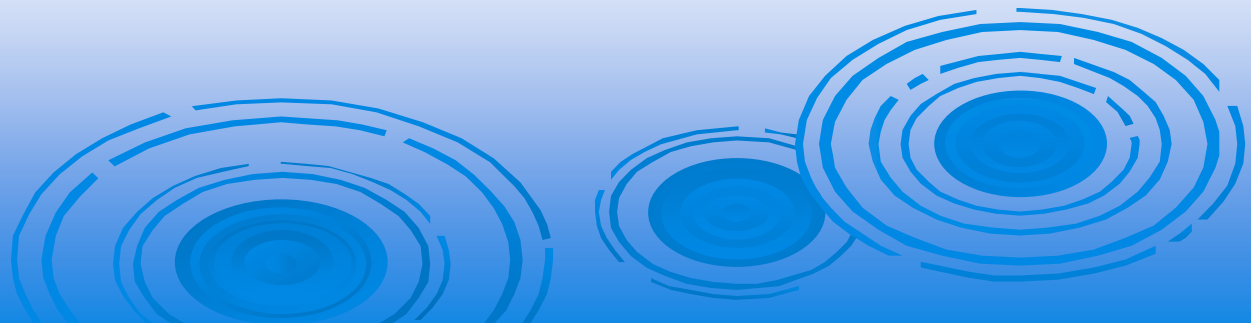
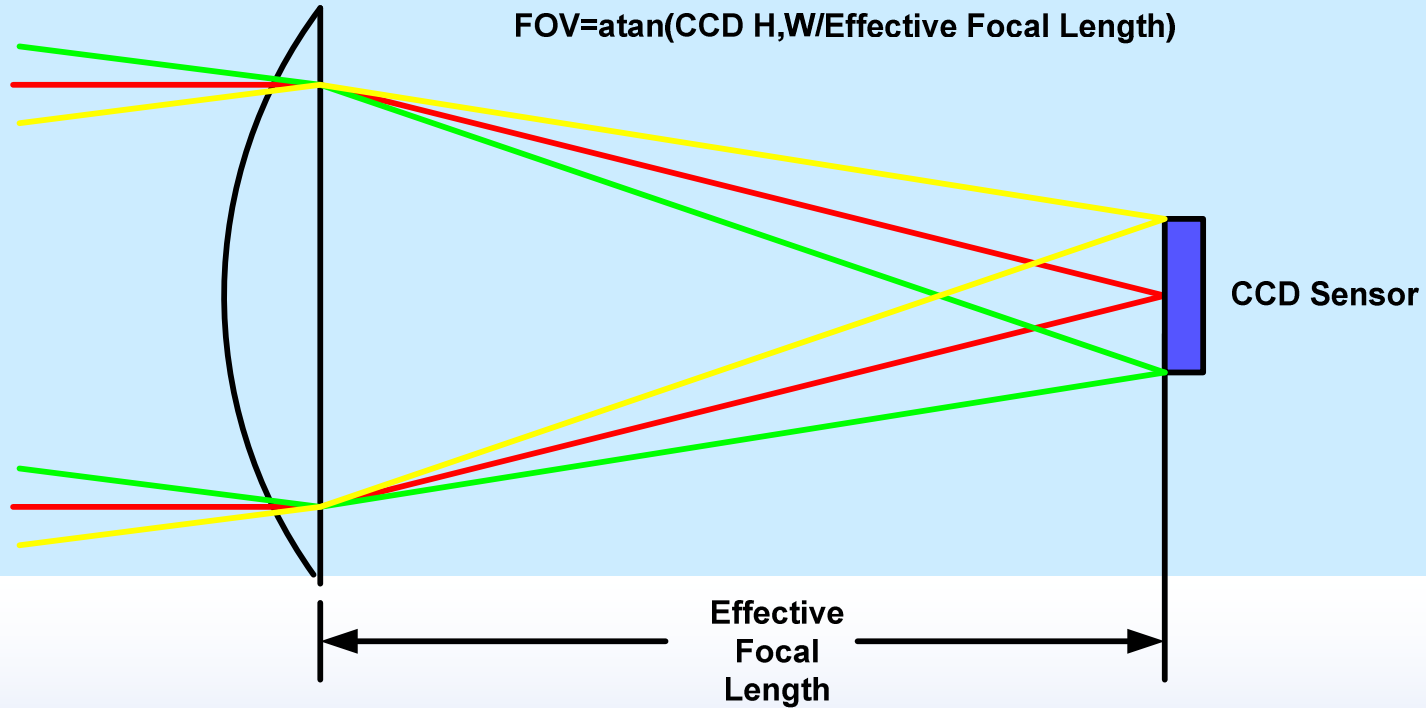


**Focal Length is EFFECTIVE Focal Length**

$$FW = 2.44 \lambda F_{\text{effective}}$$

**Pixel Size should Match Full Width Diffraction Limited Spot Size**

# Field of View



# Summary

- **Adjust Effective F# of Scope for Desired Field of View**
- **Match diffraction spot size to pixel size including Sensor Binning**
  - Increase Binning will increase maximum time
- **Calculate the CCD Sensor 'Pixel Angle', arc seconds**
  - Angle formed by Pixel Spacing at peripheral of Sensor
- **Exposure Time = Pixel Angle/15, Seconds**

