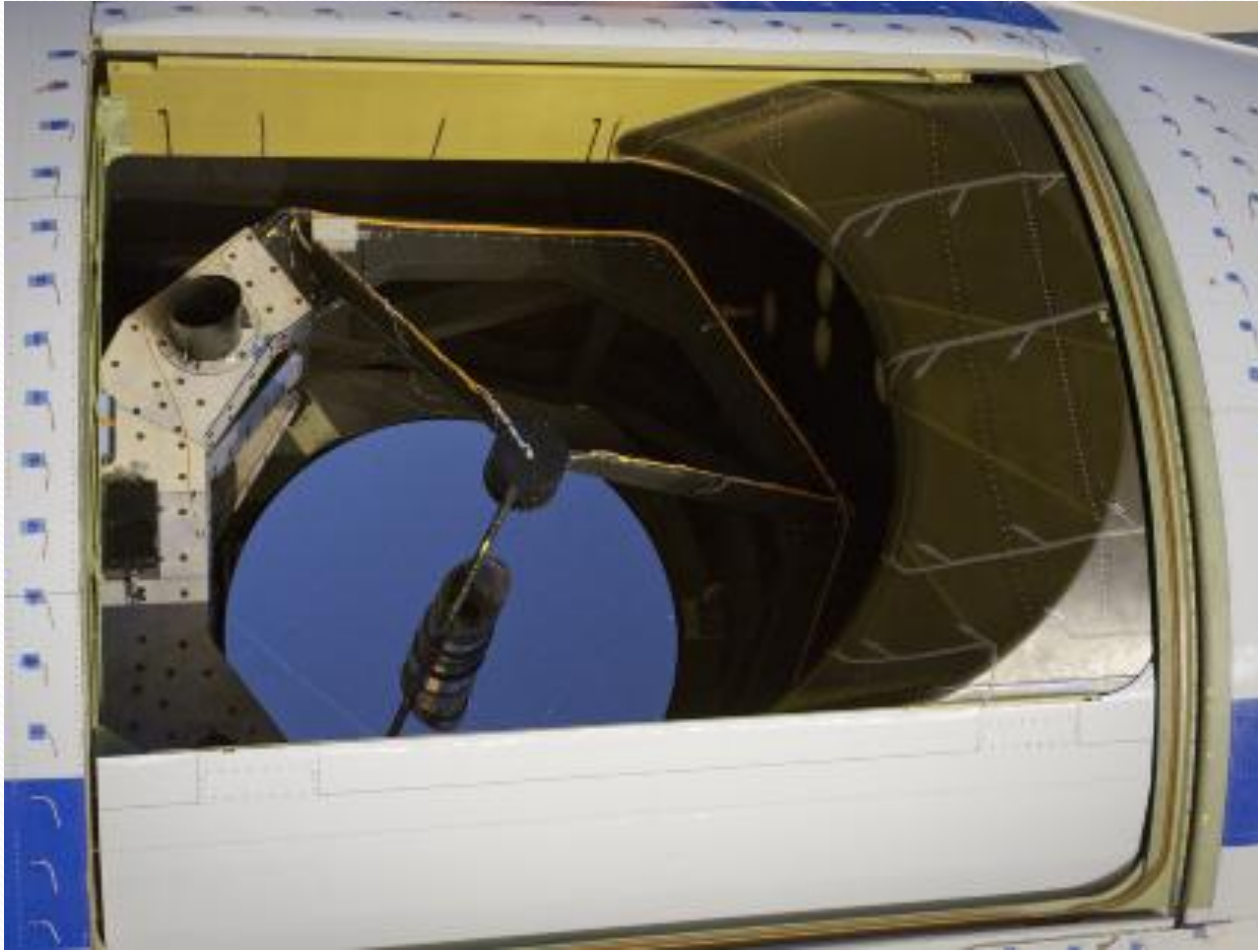
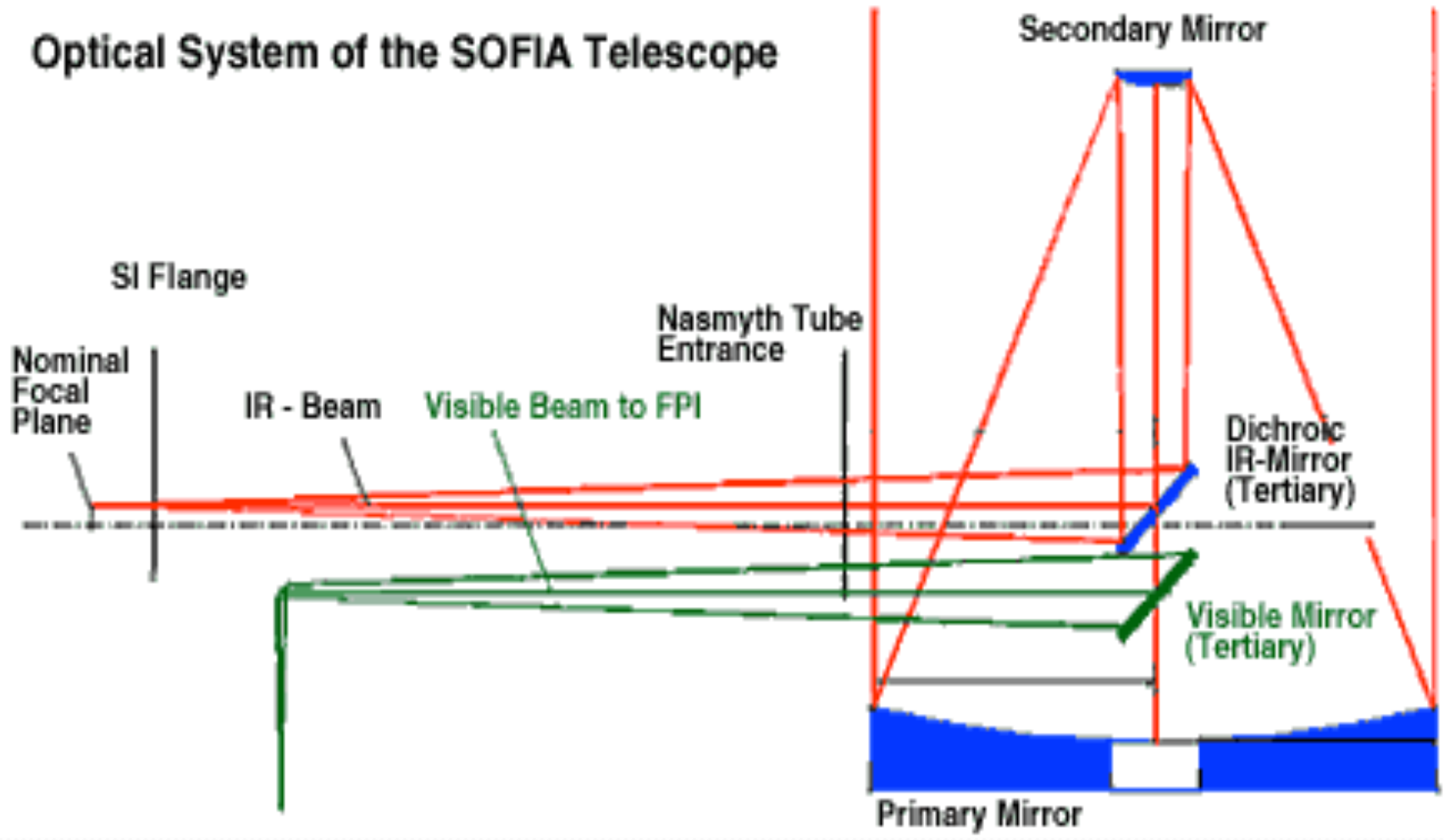


# Telescope

Martin Burgdorf, Deutsches SOFIA Institut and  
NASA Ames Research Center

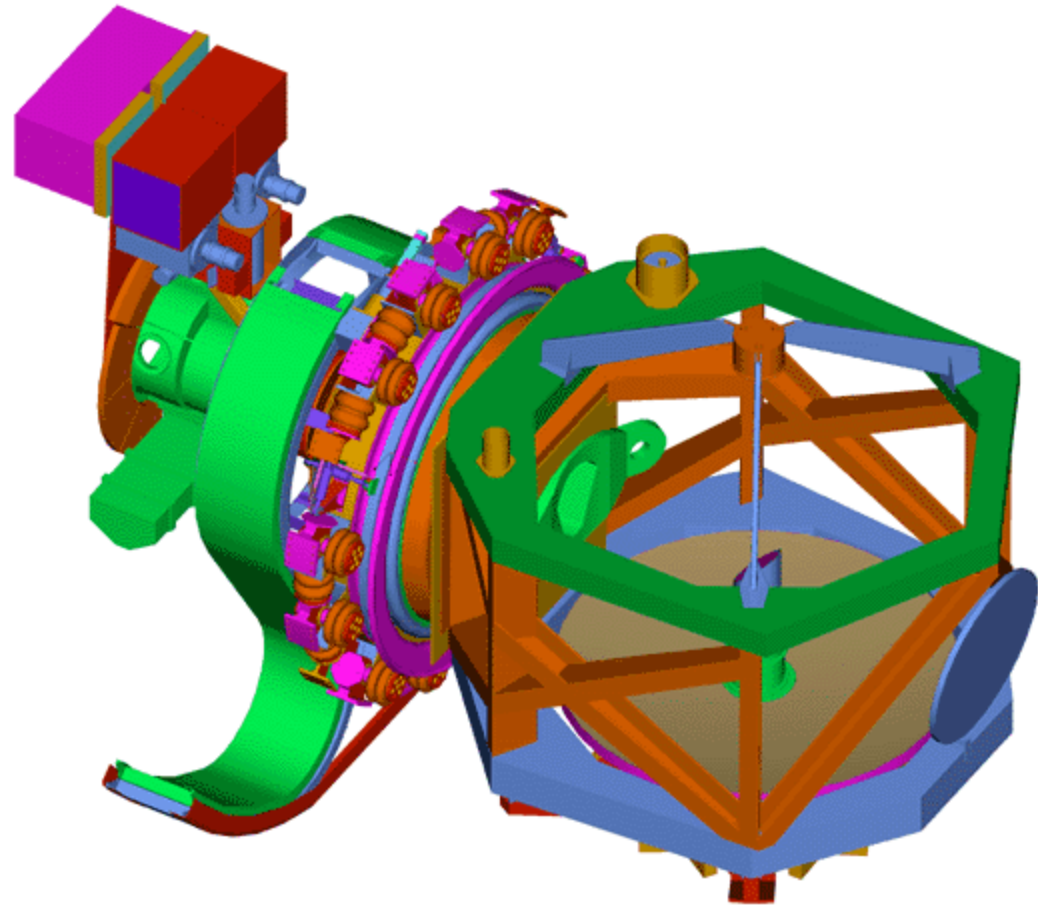


# Optical System of the SOFIA Telescope

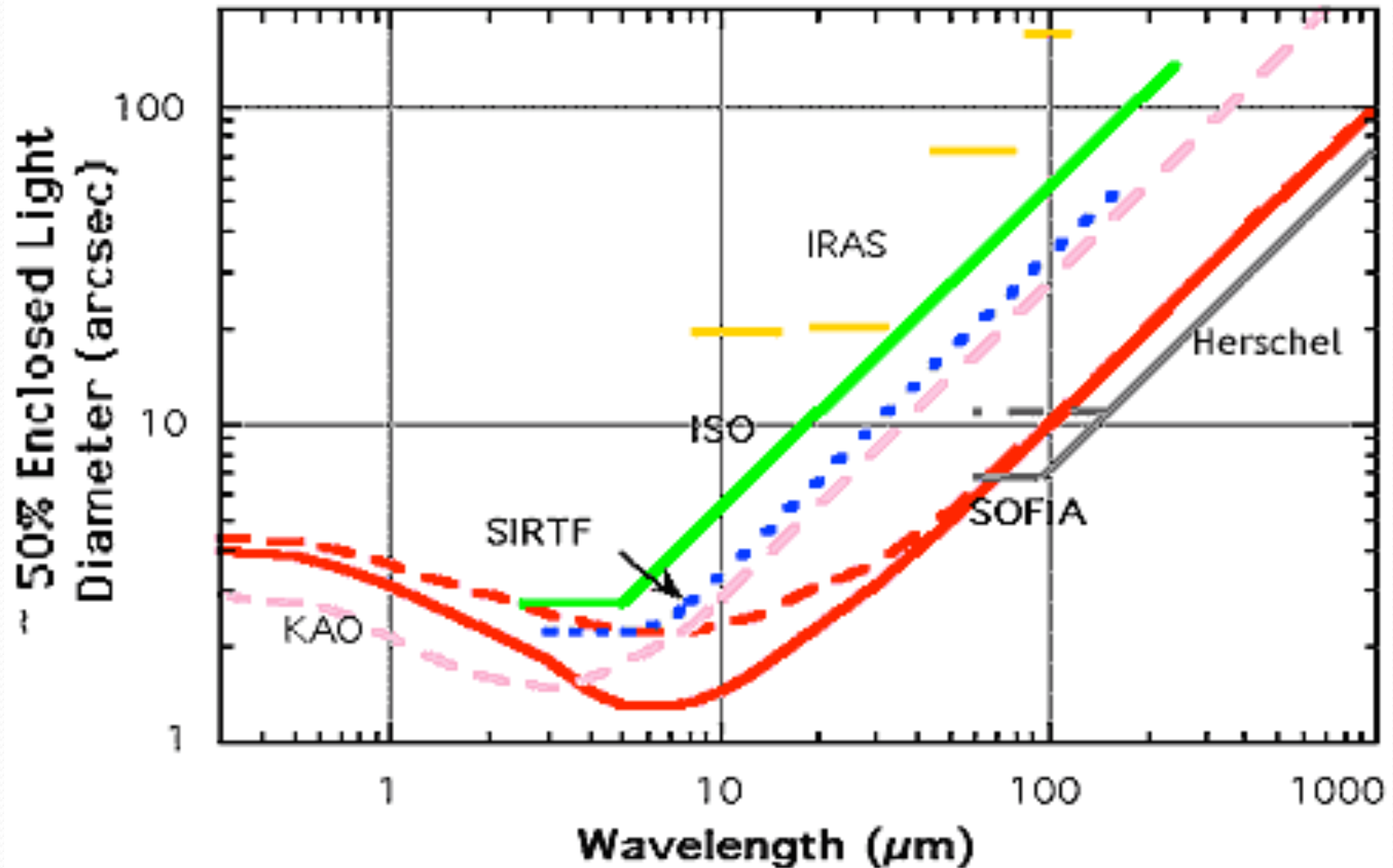


# Telescope Assembly

- ❖ Cassegrain with Nasmyth, cabin access SI
- ❖ Dumbbell shape
- ❖ rotation isolation with hydrostatic bearing
- ❖ 12 springs around 2 dir.
- ❖ Syst. focal ratio  $f/19.6$ :
  - PM with 2.7 m  $\varnothing$
  - SM with 0.35 m  $\varnothing$ , SiC, chopping
  - TM: flat (non-)dichroic
- ❖ Range in elevation  $20^{\circ}$ - $60^{\circ}$ , x-elevation  $\pm 3^{\circ}$
- ❖ Image stability: 4" for basic sci, 0.2" (goal)



# Spatial Resolution Comparison of SOFIA to Space Facilities

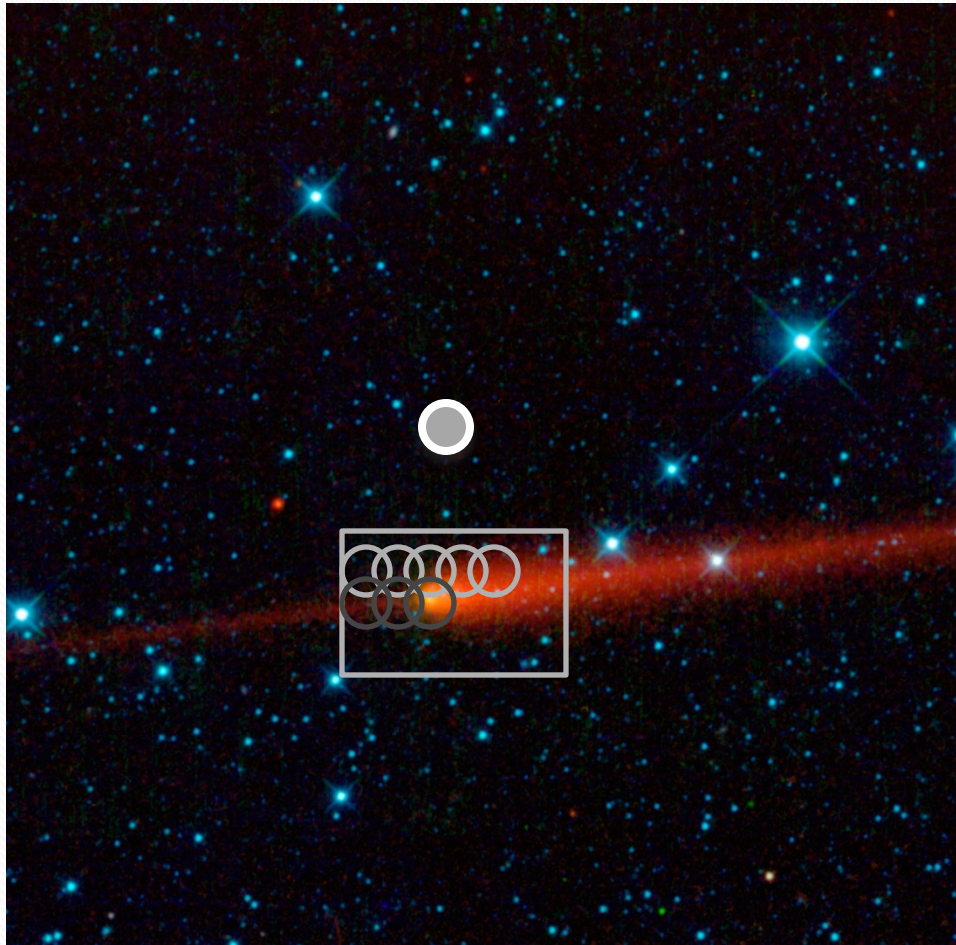


# Observing Modes With SOFIA

- ❖ **Chopping:** reference position <10' away, typical frequency 1-2Hz, symmetric or asymmetric, any direction
- ❖ **Nodding:** reference position <30' away, typical frequency <1Hz, any direction, can be combined with chopping and dithering
- ❖ **Mapping:** multiple exposures in rectangle with smaller side <13' (9' to avoid coma), combined with chopping
- ❖ **Additional instrument-specific observing modes,** for example position or beam switching during on-the-fly mapping



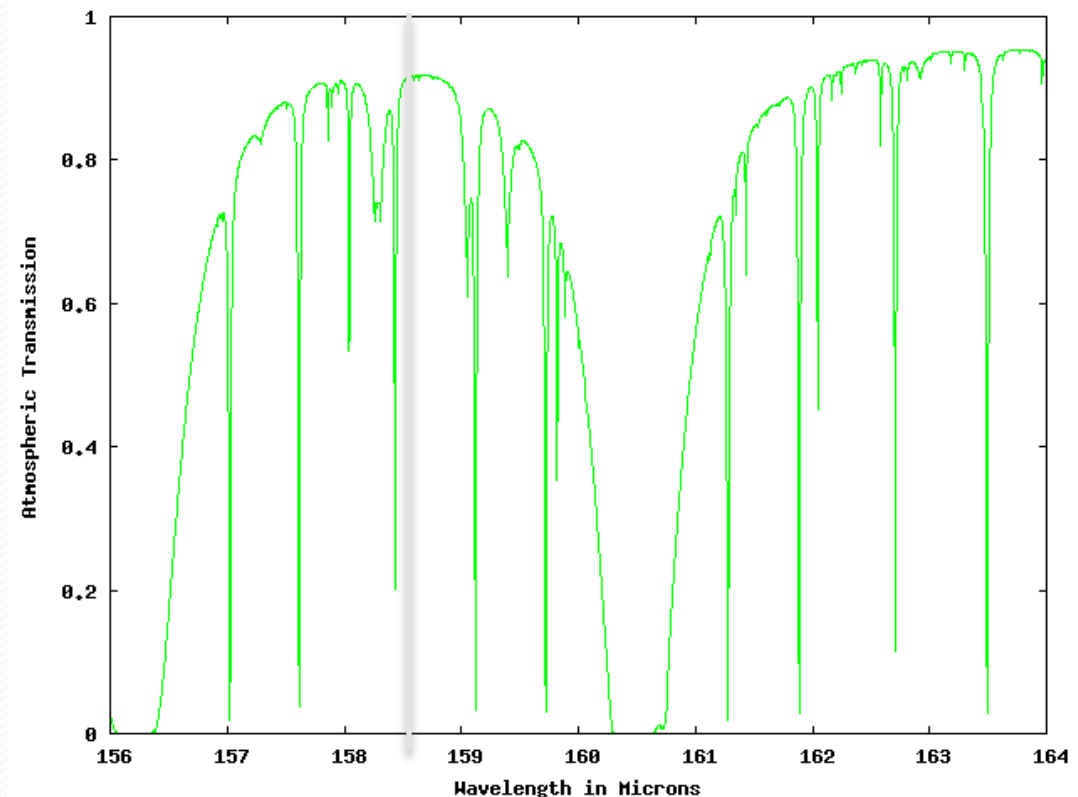
# On the Fly Mapping of a Comet



- ❖ Tel. scans row, integrates all the t
- ❖ Ref. pos. at end of row for  $\sqrt{N}$  sec
- ❖ Next row  $\frac{1}{2}$  beam away
- ❖ Repeat whole map

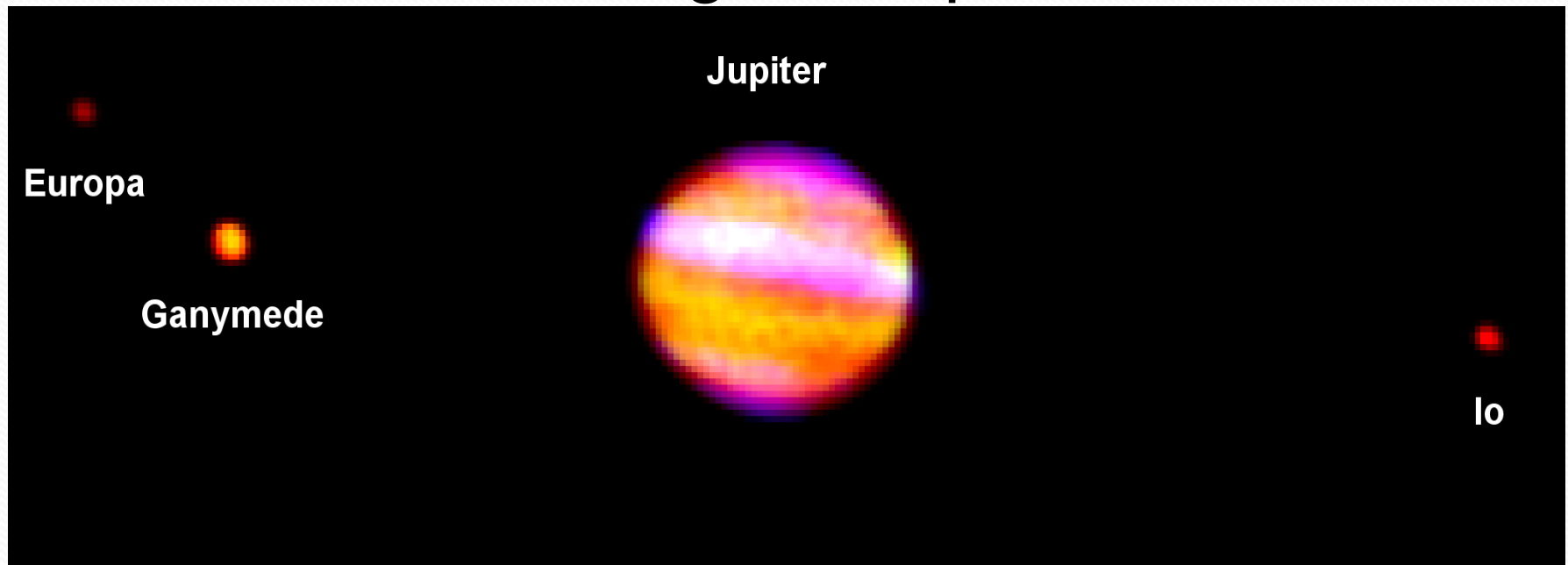
# Mapping of a Line With GREAT

- ❖ Water line at 1894 GHz
- ❖ HPBW 16 arcsec
- ❖ Line width 2 km/s
- ❖ Line strength  $1e-15$  W/m<sup>2</sup>
- ❖ 4 s integration time for SNR=5
- ❖ Sample the beam every 5 arcsec
- ❖ 4' scan takes 50 points
- ❖ Whole scan takes 200 s
- ❖ 28 s at the ref. position
- ❖ 25 rows take 100 min
- ❖ Overheads, repeat,...



# Observing Modes of SSOs

- ❖ **Guide on the object itself**
- ❖ Offset guiding on stars
- ❖ Predictive tracking with ephemerides





# State of Affairs and Next Steps

- ❖ The observatory fulfils the req. for basic sci.: image quality, flight performance, etc.
- ❖ TAC flights later this month: chopper performance, pointing jitter, seeing
- ❖ 15 basic sci. flights with FORCAST and GREAT (first light)
- ❖ Maintenance, avionics upgrade, other instr.
- ❖ Imager upgrade and possibly other tel. H/W