

■ ****Pre-Observation Preparation:****

- Check twilight times; observing can begin when the Sun is 6° below horizon (~30 min after sunset).
- Prepare target coordinates, finding charts, and ABBA nod sequence plan.
- Ensure correct slit and Fowler sampling settings in TUI TripleSpec configuration window.
- Verify telescope pointing and focus procedures; identify bright K~10 star for focusing.
- Review guider defect locations near slit; plan small offsets if needed.

■ ****Observing Procedure:****

- Move telescope to target; confirm target is in $4' \times 4'$ slit viewer field of view.
- If target is faint, use difference between two guider frames for detection (background subtraction).
- Place target in 'A' slit position (~1/3 from left edge in guider display).
- Configure Fowler sampling (use Fowler8 for typical exposures).
- Choose integration time (≤ 5 min to minimize airglow variation).
- Run ABBA nod sequence (manual or automated).
- Repeat sequence as needed for total exposure time.

■ ****Guiding and Acquisition:****

- For bright targets: Center with guider and engage guiding immediately.
- For faint targets: Enable background subtraction in TUI guider window.
- After enabling subtraction, offset telescope $\geq 5''$ to prevent self-subtraction.
- Update background frame regularly (~every few minutes) or after slews.

■ ****Spectral Acquisition Notes:****

- Airglow lines vary on minute timescales — use short integrations for better subtraction.
- Subtracting A/B pairs removes most sky background and instrumental offsets.
- Avoid saturation (limit ~52,000 DN; mild nonlinearity above 20,000 DN).

■ ****Instrument Settings:****

- Recommended slit: $1.1''$ (optimal balance between S/N and resolution).
- Avoid wider slits unless necessary for seeing $> 1.5''$.
- Fowler8 sampling recommended; gives ~7 e⁻ read noise.
- Minimum on-sky time for Fowler1 = 1.1 s; increases with N.

■ ****Focus and Seeing:****

- Use round guider images to check focus; astigmatism indicates misfocus direction.
- Adjust focus to remove elongation parallel to slit.
- Recheck focus if seeing changes or guider images elongate.

■ ****Cautions and Special Notes:****

- Beware of array persistence after bright standards ($K < 7$); avoid faint target immediately after.
- Electronic/optical ghosting and quadrant offsets mostly cancel in A–B subtraction.
- Zenith avoidance at APO: telescope cannot track above 85° altitude.

■ ****Useful Tips:****

- Use binning = 2 in guider for cleaner images.
- Regularly refresh background subtraction frames.
- Keep integration times < 5 min to maintain consistent airglow subtraction.
- Document all exposures, nod positions, and guiding adjustments.