SALT RSS-NIR MID-TERM REVIEW MAY 20 & 21, 2009

ANALYTIC OPTICS

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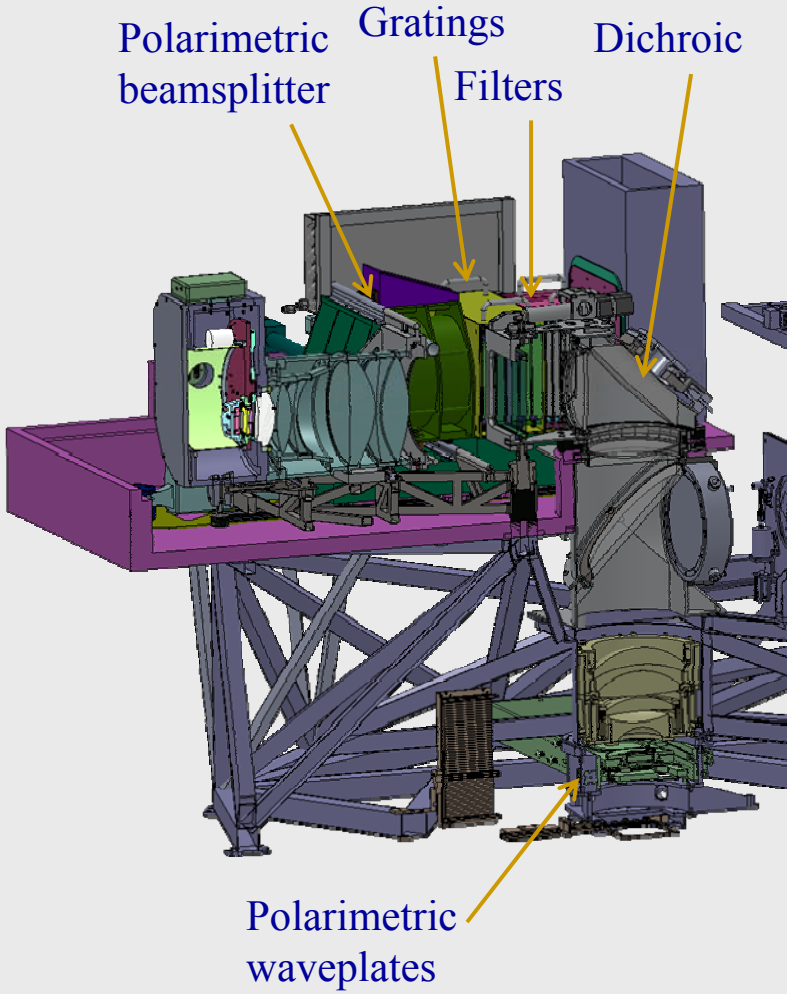
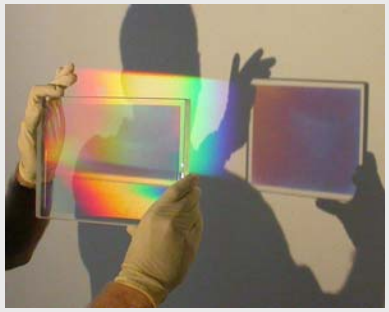
OVERVIEW

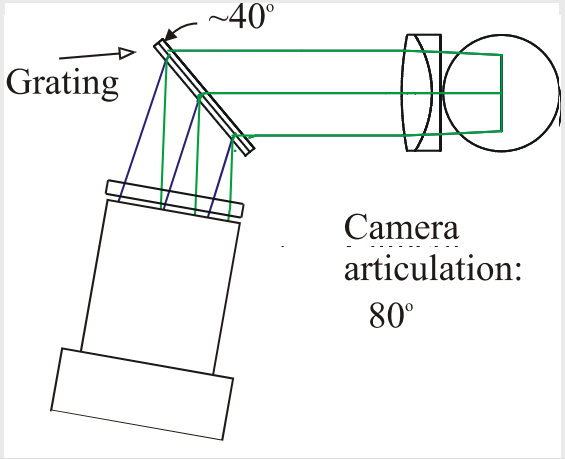
- Dichroic
  - One, crossover 0.9μ, fixed
  - Precedes final collimator doublet
- Imaging Filters
  - Y, J, H
  - 1-3 in 12-grating magazine, shared w/ FP, easily interchanged via “airlock”
- Gratings
  - 4 VPH, 1 conventional (?)
  - 5-grating magazine, change at maintenance time only
- Polarimetric Optics
  - Existing rotating ½, ¼ λ waveplates in collimator, 0.32 – 1.7μ coverage
  - Insertable Calcite Wollaston beamsplitter before camera

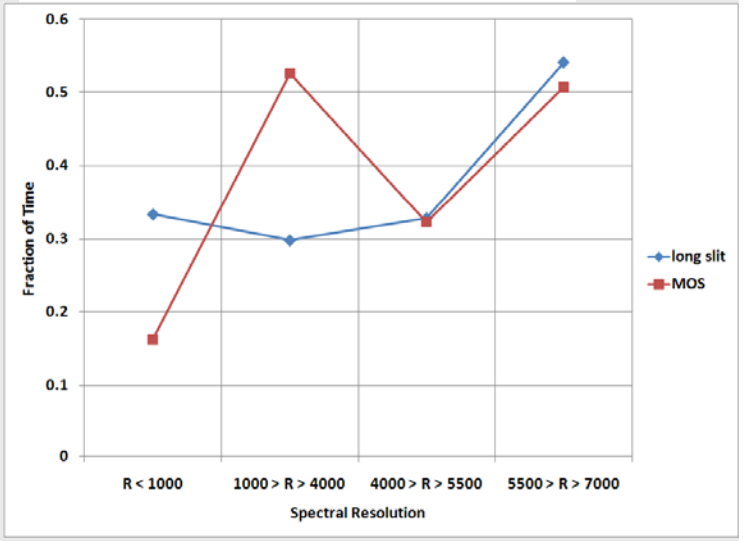


GRATINGS

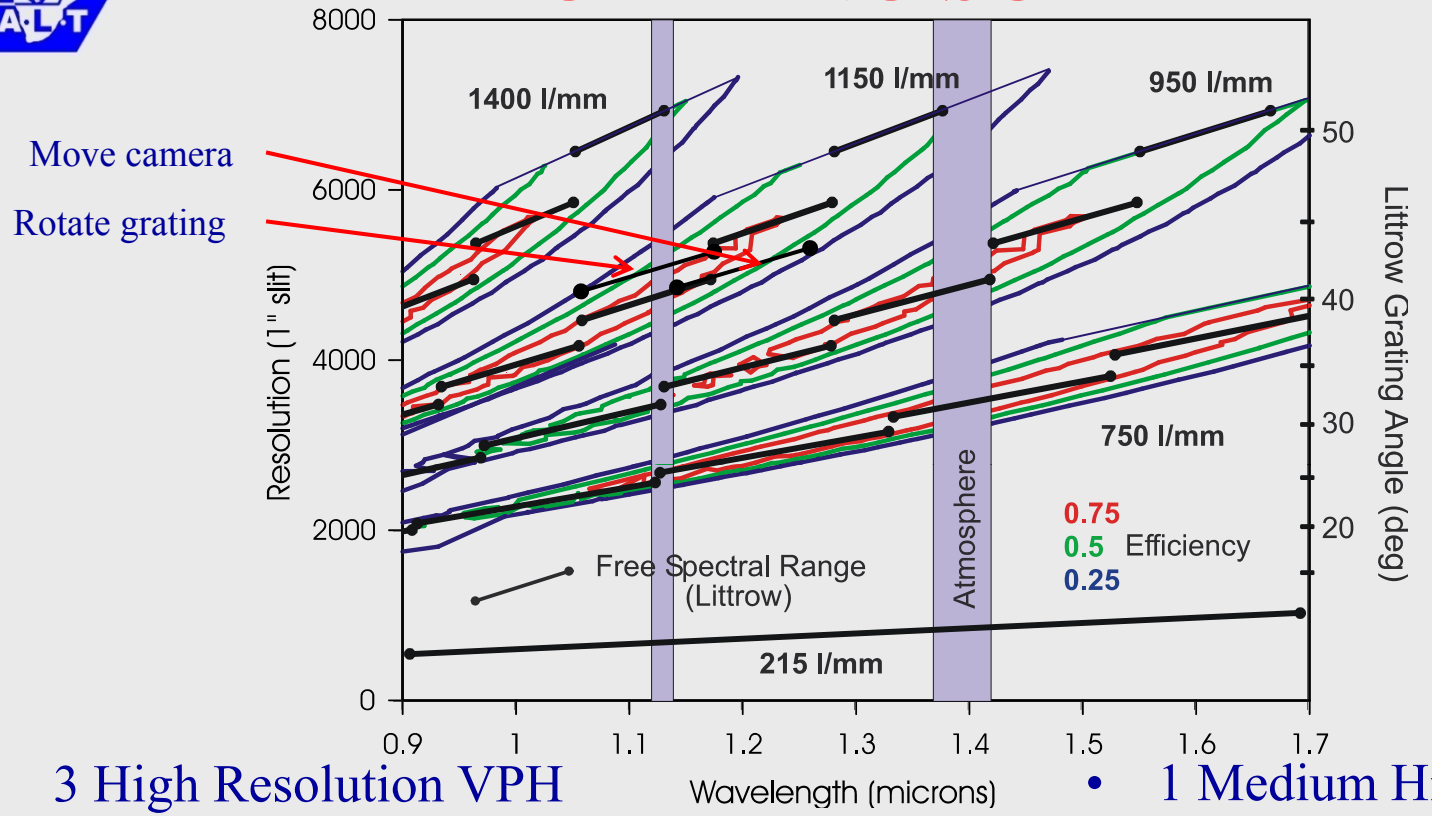


- VPH Gratings/ articulated camera: Instrument main feature
  - High 1st order efficiency, especially at higher R
  - Tunable blaze: With camera articulation, small number of gratings efficiently covers more observing space
  - Pupil size and max articulation set max R = 14,000
- Suite set by Science programs
  - NIR faint programs R > 4000 to get > 50% band away from night sky
  - High S/N (e.g. polarimetry), high speed single objects prefer full coverage, R ~ 800





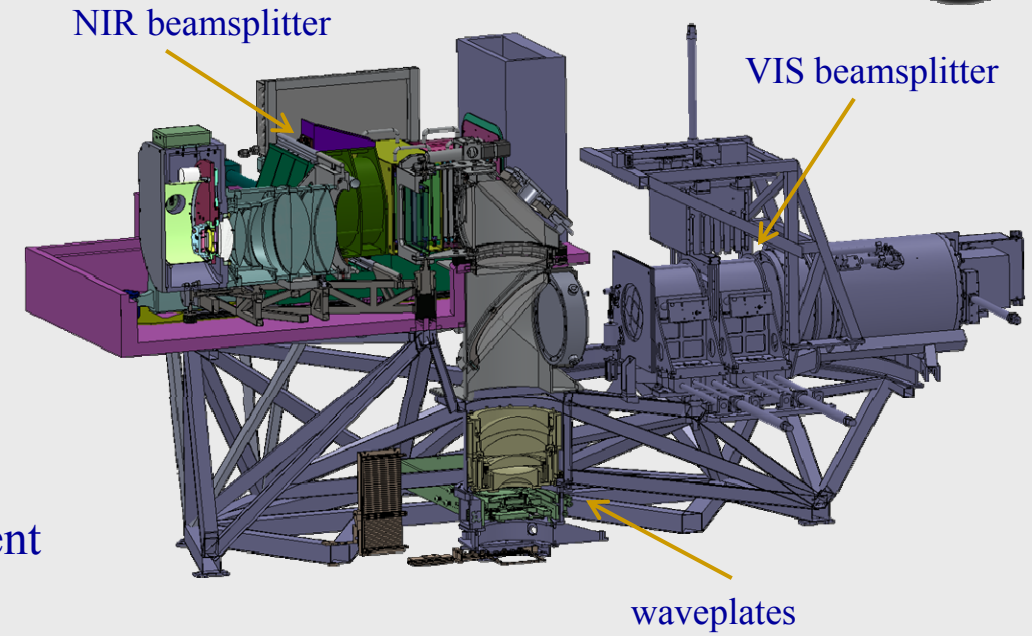
GRATING SUITE

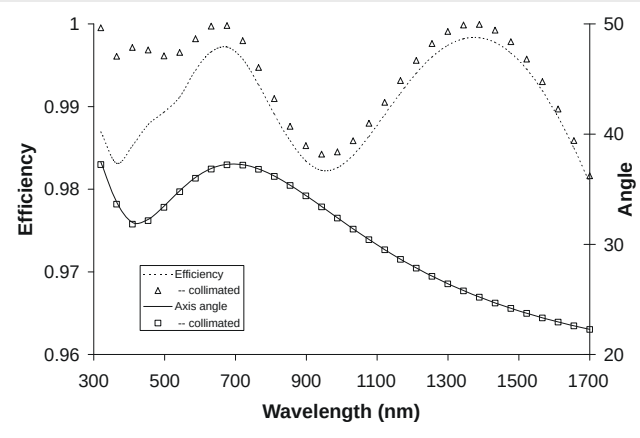


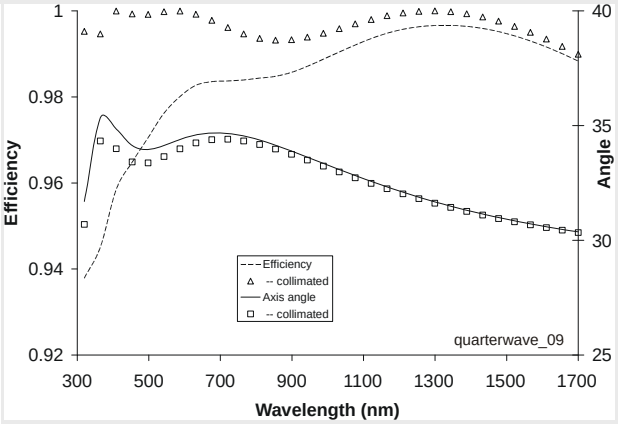
- 3 High Resolution VPH
  - 1400, 1150, 950 l/mm
  - Superblaze R ~ 5000
  - Adjust holographic properties to give wide efficiency (dn ~ 0.1). Go off-Littrow to adjust spectral coverage
- 1 Medium High Res VPH
  - 750 l/mm
  - Brighter MOS programs
- 1 Low res
  - Probably conventional
  - ~ 200 l/mm R = 800
- To do: further optimize gratings suite based on consortium proposed science

POLARIMETRY: WAVEPLATES

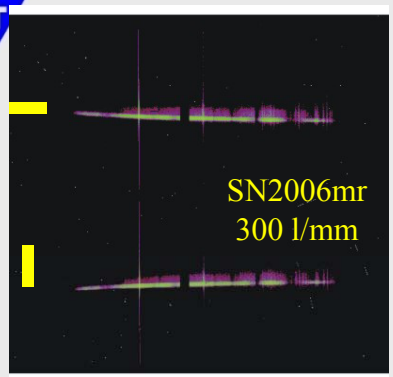
- Modeled on Vis beam
  - Non-cryogenic
  - Wide-field design for grasp
- Existing waveplate slides
  - Linear: ½ λ
  - Circular, all-Stokes: ¼ λ, ½ λ
  - Rotation by stepper, active detent
  - Superachromatic 0.32 – 1.7μ

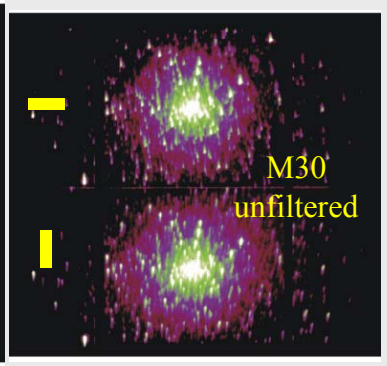


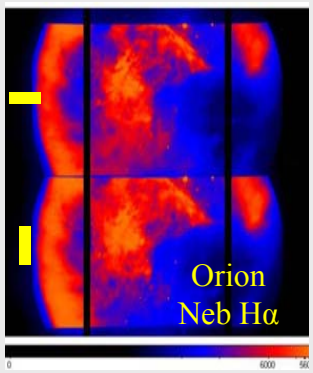


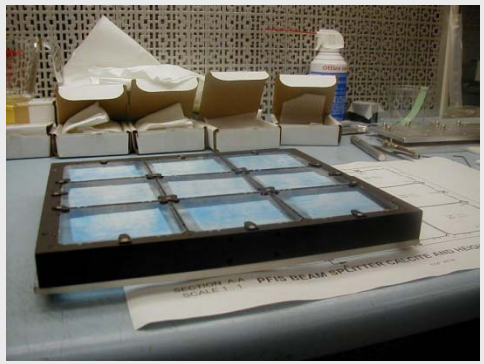


POLARIMETRY: BEAMSPLITTER









- Vis Beamsplitter
  - 3x3 mosaic of fluid-coupled Calcite Wollastons, fluid for suppression of ghosts and to ease alignment of mosaic with imperfectly matched calcite wedges
  - 14.3 deg angle Splits E and O beam perpendicular to dispersion 4 arcmin, with 20 arcsec chromatic dependence
- Vis on-sky data
  - Grating: longslit stellar, diffuse; MOS not yet tested
  - Imaging: unfiltered + FP interference filters (for λ cal)
  - Fabry Perot: single etalon
- NIR beam splitter: all that is required to do this in the NIR
  - Air spaced. AR coatings better in NIR; more available NIR calcite allows selection of prism elements for more accurate alignment
  - 15 deg prism angle, 10 arcsec chromatic

DICHROIC

- Crossover point: 900 nm, longward of Ca triplet
- Uniformity spec possible issue for polarimetry
  - Anecdotal experience with other dual-beam spectropolarimeters sometimes shows instrumental polarization calibration issues at 0.1% level, concern for high S/N programs
  - Likely explanation: non-uniformity of polarimetric performance of dichroic. With slit-limited spectropolarimetry + imperfect focus, dichroic is illuminated non-uniformly, changes with seeing and focus
  - Pupil variation with SALT telescope configuration presents a similar issue, though this can in principle be calibrated out
  - Uniformity improvement to meet 0.03% repeatability spec 3x, not difficult with care
- To do:
  - Specify and test dichroic polarimetric uniformity
  - Experiment (Vis beam) with comparing slit with slitless polarimetric mode to analyze SALT pupil variation effect