

Jay Elias

Attendees:

(NOAO)

Todd Boroson

Arjun Dey

Jay Elias

John Glaspey

Di Harmer (video)

Steve Howell (partial)

Dick Joyce

Mike Merrill

Knut Olsen

(OSU)

Paul Martini

General outline of meeting –

Paul Martini made a presentation on the OSMOS design (located [here](#)). This contains additional information beyond the earlier presentation, in response to questions from NOAO staff.

- Designed for 2.4-m Hiltner telescope
- 0.3 arcsec/pixel over 20 arcmin dia FOV
- Rapid switch between imaging & spectroscopy
- Science motivations –
 - clusters of galaxies
 - ability to do TOO, time series monitoring (e.g., AGN)
- Optical layout – about 1 m length
 - tempting to leave collimator alone
 - would like camera to be faster (probably around f/3 instead of current f/4.9); camera is adapted to specifics of existing detector dewar (not necessarily true for KPNO but see later discussion)

- design includes CaF₂ elements; some UV glasses; range of CTE raises some thermal issues. Vendor testing to verify bonded optics could withstand range of operating temperature.
- filter wheels tilted to avoid reflections/ghosting; mechanisms in 4 wheels (slit, disperser, 2 FW) nearly identical; would like to retain design -> limits on increasing pupil size due to increased collimator focal length.
- OSMOS slit masks are curved but 4-m can be flat (at least for 12 arcmin FOV). Cutting to be done using LBT laser cutter (on UA campus).

Discussion of process for making masks –

- ability to work from astrometry vs. requirement for pre-imaging. There seemed to be a strong sense that we don't want to require observers to do pre-imaging.
- how to get the masks fabricated – cost for LBT machine was ~\$250K but this is a 3-axis capability. Although we have used a commercial vendor in Phoenix for MARS/FLAMINGOS masks the option of using the LBT set-up should be explored.

Description of status – complete assembly in lab end of calendar year; commissioning on telescope March/April

- first measurements of throughput will be at telescope
- barrels purchased as a unit w/ comprehensive acceptance testing at vendor; warranty on barrel assemblies.
- images of delivered barrels
- images of some delivered mechanisms
- images of enclosure – 600 x 600 x 952 mm (without dewar); attaches to telescope at "front"; electronics boxes mounted on sides (length with MDM dewar is ~70 inches)
- low dispersion prism – high throughput but relatively low dispersion - <200 outside blue
- dispersers can be quite heavy; need to ensure wheel is balanced

- a couple of designs for VPH grisms – one example is $R=1600$ [MDM] peak response ~ 500 nm; another $R=6000$ peak response ~ 870 nm.
- discussion of size of field of Risley prisms, other properties – need to look into this at NOAO end.

Expected performance –

- Image quality < 0.5 arcsec FWHM
- Imaging throughput w/ CCD 60% 400-1000 nm, 50% at 350 nm
- Spectroscopic throughput $\sim 50\%$ with prisms; $\sim 40\%$ at peak with VPH grisms
- actual OSMOS performance will be slightly worse in UV since actual glasses differ slightly from nominal properties – need to check melt data when procuring blanks for KOSMOS
- discussion about including filter in disperser; pros and cons; would MARS grism be usable?
- CCD is blue-sensitive 4kx4k Fairchild
- discussion of feasibility of using a “universal” dewar for KOSMOS so that detector usable elsewhere. (Need to check physical dimensions as well)

Knut – ReSTAR science cases –

- Low resolution ~ 100 useful for solar system solid bodies (emphasis on blue? Arguments that in red it's better to work between OH lines, then to bin to get desired low resolution)
- $R \sim 1600$ useful for redshifts
- $R \sim 2250$ (blue) matched to spectral classification; SDSS resolution
- $R \sim 3000$ (red) Ca triplet; separate OH lines in red -> higher is somewhat better
- Higher resolutions – radial velocities

Brief discussion of looking into XD mode (like ESI)

Discussion

Question about what the long lead time items were – real constraint has been resources spent on MODS and not procurement times (same vendor for triple prism and optics barrels); have quotes only for grisms. Lead time for optics was about a year but no effort was made to push delivery because of the resource constraints.

Discussion of acquisition – is existing slit viewer useful? Discussion of flexure in guider. Overheads likely to be dominated by detector. Discussion of possibility of having more than one detector. If the universal dewar design will fit it allows for more than one detector in future (current budget only permits one); reduces design effort and allows new detector system to be used elsewhere.

Conclusions

OSU priorities for redesign:

- **faster camera.** We did not settle on a precise value for the preferred pixel scale. It would seem worth looking at values around or slightly greater than 0.3 arcsec/pixel. The emphasis is in spectroscopic image quality; direct imaging is very much secondary. Note that this implies image quality over a larger portion of the array (better spectral coverage) is important. One question (see below) is whether the image quality should be matched to a 3-pixel slit.
- **VPH grism designs.** If $R \sim 4\text{-}5000$ is achievable without collimator redesign for a 1 arcsec slit on the 4-m, that should be acceptable for the bulk of the science now being done or contemplated. If this is not the case, collimator designs that do not require mechanism redesign (and that fit within the cass cage) can be examined.
- **Lower priority:**
 - Look at required geometry for slit-viewing in long-slit mode
 - Look at cross-dispersed option(s) in preliminary way

NOAO priorities:

- provide information on universal dewar
- provide information on guider interfaces (if needed beyond information on web)
- investigate Risley prism properties
- assess calibration capabilities currently available, potential for upgrades if required
- assess guider flexure
- start looking at available 4k x 4k CCDs. [*Editorial comment added:* Note that experience with the Goodman spectrograph on SOAR suggests that fringing in the red with their “blue” Fairchild CCD is a problem. Compare with E2V 231 4k x 4k (options like fringe suppression). Also note NOAO’s intent to upgrade the KPNO Mosaic CCDs.]
- further assessment of science case – particular issues:
 - is the triple prism an attractive option at 60% of the resolution achieved with OSMOS? If not, this may drive priority for a low-resolution cross-dispersed option.
 - quantify and prioritize desired resolutions and center wavelengths.

NOAO/OSU priority:

Need to produce a draft operations concept document. It is likely to help focus future discussions.