

# TCSU System Design Review

- April 26, 27 2010 at WMKO
- Positive report
  - TCS Upgrade is off to a very good start with project management with all the right approaches to preparing requirements, WBS structuring and systematic cost/schedule/risk estimations.
  - The project is ready to move forward to the preliminary design phase.
- Top level concerns
  - Ambitious scope given the resources
  - Encoder system is more complex and expensive
    - WMKO responds: Investigate an alternative encoder mounting (promising)
  - Upgraded encoder system may not meet performance requirements
    - WMKO responds: Install a prototype to validate models before full commitment
  - Observatory should reconsider meshing architecture of TCSU+NGAO
    - WMKO responds: They will review these decisions
  - Insufficient availability of key engineering staff
    - WMKO responds: Prioritize recruitment to ensure full staff complement
- The SSC commends the TCSU team on the successful passing of System Design and recommends they proceed to PDR

# Federal Proposals

- NSF ATI: IR Tip-tilt successful
  - Funded
  - Dramatically increases sky coverage and improves Strehl
  - Mitigates substantial risk to NGAO program
- NSF MRI Program: Submitted KII Laser
  - Purchase one NGAO laser to replace KeckII dye laser
  - Collaboration with TMT and ESO
- NASA requests 5 extra nights
  - K1 bright time
  - Tentatively allocated to TCSU
- NSF TSIP (due September 17, 2010)
  - Letter of intent named 3 possible projects: AO, KCWI, K1 deployable tertiary mirror
  - Other projects (e.g. OSIRIS grating) not ready for this deadline
- NSF ATI (Due early November, 2010)
  - Prime candidates: AO (PSF reconstruction), OSIRIS grating, Imaging polarimeter for NIRC2
  - WMKO recommends pursuing multiple submissions

# Keck Observatory Archive

- NASA funded
  - Emphasis on extrasolar planet observations
  - HIRES and NIRSPEC thus far
- KOA team recommends NIRC2 next
  - 3<sup>rd</sup> most popular NASA instrument
  - Strong extrasolar planet connection
- SSC agrees with the KOA decision to archive NIRC2 data, and will encourage the WMKO community to better advertise KOA to astronomers world-wide.

# Keck 2011 Plan

The 2011 Keck plan strongly adheres to the scientific and strategic goals of the 5 year plan

Major deliverables: completion of MOSFIRE, KI LGS, and K2 laser launch telescope; KCWI reaching PDR

Recoating of K1 segments, as well as both secondaries and tertiaries, will be completed in FY11

Crucial seismic upgrades will begin in 2011.

The SSC recommends adoption of the proposed 2011 plan and commends the observatory management on their adherence to scientific goals and to fiscal prudence.

# NGAO PDR

- NGAO refresher: Benefits a wide variety of science via its High nIR Strehl, very high sky coverage (~80%), correction down to 7000 Angstroms, only moderately variable PSF, & 0.7 – 2.4 micron single field IFU spectroscopy.
  - NGAO will lead the world in high performance, narrow field AO
- NGAO PDR held on June 14 & 15
  - Review was passed – SSC congratulates the team
  - Review committee very enthusiastic about NGAO team, system potential, and design
  - Concerns about adequate team staffing, aggressive schedule, and lack of funding for future project phases.

# NGAO Science Input

- NGAO Science Advisory Team (NSAT; M. Morris chair) has refined and augmented NGAO science drivers with much community input
- A comprehensive Science Requirements document is complete, with good linkage between science cases, observing requirements, and technical requirements
- NGAO performance estimates include sophisticated simulations (e.g., Monte Carlo modeling) informed by current system performance.

# Path to Early Science with NGAO

- WMKO has secured funding for several important elements which will lead to early science benefits
- NGAO laser launch telescope for K2 funded by NSF MRI August 2009
- Near-IR tip-tilt wavefront sensor funded by NSF ATI
- NSF MRI Proposal submitted to procure & implement first NGAO laser on K2 in collaboration with ESO & TMT (outcome expected by September 2010)
- The next efforts being considered are:
  - Improved tip-tilt correction for enhanced sky coverage
  - Focal anisoplanatism reduction
  - PSF reconstruction

# MOSFIRE Report

- Cool down #4 successful
  - Discovered cracked magnet debris causing shorts in coils of adjacent magnets (ratchet clutches)
  - Cause of cracking is differential contraction of magnets and housing
    - Issue of CSU reliability after future thermal cycles
    - Only 2-3 thermal cycles so far
  - Filter wheel, focus mechanism, bad detector cable all fixed
- Cool down #5 now in initial stages, including all internal components of final instrument configuration.
  - Images and spectra now being taken in J and Kshort bands
  - Performance is excellent thus far
- Preparations for CD#6 underway
- Key risks outstanding
  - Performance of optics and detector (so far so good)
  - CSU reliability due to magnet cracks
  - Software completeness and stability
- First light planned for November 2010
  - 2 month slip since February 2010
- The SSC commends the MOSFIRE team on their progress, the excellent results from Cool Down #5, and looks forward to the commissioning of this world-class instrument.
- The SSC recommends a risk assessment related to the magnetic debris to be evaluated by WMKO



# LRIS Red Detector Upgrade

- Characterizing 2 new 2kx4k LNBL detectors
  - 1 works well with both amplifiers
  - 1 works well with 1 amplifier so far but will probably be able to optimize to bring into full operation.
  - Read Noise 4.5 electrons. QE matches/exceeds previous devices
- Building new dewar to avoid downtime for existing camera and to facilitate changeover
  - Fabrication on schedule; ready for devices in Aug 2010
- Changeover to new devices complete by Jan 2011
- The SSC applauds UCO's ability to make fast progress on a new dewar and detector characterization.
- The SSC recommends that UCO obtain quotes and specifications on alternative red-sensitive devices (e.g. Hamamatsu, E2V) as a backup plan.

# KCWI -- Keck Cosmic Web Imager

- 3D, Low Surface Brightness Spectroscopy
  - Broad range of science from young stars and tidal streams, circum-galactic and QSO medium, structure of galaxies at high-z to Ly  $\alpha$  emission from IGM cosmic web at  $z > 2$
- Competition from VLT instrument, MUSE, scheduled for 2012
- Risk areas include grating delivery, high performance coatings, red sensitive CCDs, and sky subtraction precision
- Experience using CWI at Palomar mitigates Keck risk
- Technical-driven schedule
  - PDR in Fall 2010
  - DDR in Summer 2011
  - Commissioning at end of 2012

# KCWI -- Keck Cosmic Web Imager

- Beginning long term procurements (gratings and glass for blue camera) during DDR on basis of Palomar precursor
- The SSC is impressed by the on-sky performance of CWI and eagerly awaits the PDR for KCWI. We are particularly interested in a demonstration of sky subtraction to  $10^{-4}$  precision.
- The SSC requests a cost-benefit analysis of obvious descopes (e.g. one camera, fewer gratings).

# Concept Study Proposals

Development	PI	Concept Study Contributed	Concept Study Funding Requested	Estimated Project Cost	Funding Targets	Recommendation
NIRC2 Polarimeter	Fitzgerald	>12.5 K	~5K	500K	2010 ATI/2011 MRI	Fund
High Contrast Imager	Wallace	100%	0K	5-10M\$	NASA technology/NASA ground based	Decline
Subaperture XAO	Serabyn	internal JPL, APRA ??\$	30K	APRA 100's of K\$	NASA APRA	Fund
NIR RV	Plavchan	100%	0K	1-10M\$	NSF/NASA 2011	Accept targeted (option 1) study
NIRSPEC detectors	McLean	some cost sharing	35K	~2M\$	NSF/ATI, MRI, TSIP (2011)	Fund – emphasize science
K1 M3	Prochaska	56K	56K	~1M\$	NSF/ATI, MRI 2010	Fund – address scheduling/obs issues
LRIS gratings	Treu	N/A	N/A	~25-30K\$ per grating, up to 4 gratings	NSF/ATI, TSIP, 2010	Fund – red grating FY11, others FY12

# Federal Proposals

- Imminent deadlines are TSIP (Sep 10) and ATI (early November).
- SSC discussed options for both programs but needs more information from prospective proposers and is concerned at the uncertain readiness of many of the leading possibilities.
- SSC evaluated the possibility of a staged approach to NGAO, upgrades to existing instruments, taking KCWI to DDR, and initiating proposals reviewed in response to the White Paper call
- SSC requests 3-page outline proposals (science case, planned work and total cost) from potential proposers by August 2.
- SSC will schedule a telecon to review the options in early August prior to making recommendations.

# TSIP (10 September)

- The SSC recommends the following actions:
  - The KCWI team prepare an outline proposal that would take the instrument design through DDR
  - The NGAO team develop up to 3 outline proposals, with a cap in year 1, for:
    - PSF reconstruction
    - improvement of near-IR tip tilt sensing
    - laser tomography using the existing AO system
  - WMKO/COO/UCO Directors inquire on the possibility of a 24 night exchange and its optimum justification
  -

# ATI (early November)

- The SSC ranked the OSIRIS grating+detector upgrade as the most desirable proposal but is concerned UCLA proposers have insufficient time to prepare the case
  - - WMKO will offer to assist in its completion
- Imaging polarimetry with NIRC2: Fitzgerald (UCLA) should be encouraged to submit a proposal
- The AO proposals drafted for TSIP will also be considered for ATI
- Deployable tertiary: WMKO/COO/UCO Directors and NASA representatives should consider the practicalities of developing a proposal
  - The SSC requests an estimate of the minimal costs to the observatory to facilitate instrument swapping
  - The SSC requests the directors to consider cross-institutional ToO/cadence scheduling