

# SSC Report (Public)

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# WMKO Report

Good response by the Decadal Survey to Keck inputs, ASTRO2010 proposed mid-sized NSF opportunity, and recommended increased funding for ATI and stable TSIP funding.

NSF proposals submitted: TSIP (55% KCWI, 45% NIRES), 3 ATI proposals (OSIRIS grating; AO-PSF determination; NIRC2 polarimeter), all awaiting decisions.

Major issues: what to submit for next MRI opportunity, how to fund future KI operations.

Operational issues: KII segment re-coating finished, initiated for KI segments.

# WMKO Report

TCS upgrade project design study now well underway, with key personnel successfully recruited. PDR expected in Aug 2011.

Mirror crack repair study heading to a review in June 2011.

PDR for free space laser beam transport for Keck I held Oct 2010.

# Keck Interferometer: Current Status

- Several unique aspects: mid-IR nulling, sensitive NIR spectroscopy ( $\sim 3$  mag better than VLTI), L-band spectroscopy.
- TACs allocate  $\sim 15$  KI nights/yr (30 telescope nights)
- Recent science results in YSOs, transition disks, AGN.
- ASTRA upgrade underway
  - (1) Self-referencing mode [in operation]: enables  $R \sim 1800$  spectroscopy
  - (2) Dual-star mode [in commissioning]: large sensitivity increase
  - (3) Exoplanet astrometry [in development]: 30-100  $\mu\text{as}$ , primary science (planet mass distribution) needs long time baseline

# Keck Interferometer: The Future

- Strengths compared to the competition
  - Current unique capabilities (see last slide)
  - ASTRA astrometry will be only large aperture system until VLT/GRAVITY (2014+)
  - Only astrometry with LGS (sky coverage)
  - Efficiency and flexibility of observing modes
  - Flexibility for future development (e.g. ASTRA).
  - LBTI will be more sensitive in thermal IR, but 5x smaller baseline.
  - High spectral coverage (2-10 microns)
- OIR interferometry endorsed by Astro2010 O/IR panel but not the main report. ASTRA astrometry does address some of its exoplanet science goals, but one needs a long time baseline (+3-6 years) to observe a large sample. Similarly, the most compelling Galactic Center case requires observations in 2018.

# KI: SSC Comments + Recommendations

- KI and ASTRA are identified in the Keck Strategic plan as a major component of high angular resolution science at WMKO. They provide unique and world-leading capabilities.
- The scientific promise of KI enhanced by ASTRA is substantial, especially in the areas of planets, star formation, Galactic Center, and AGN.

# LRIS-R

The LRIS-R detectors have suffered further degradation through the summer/fall of 2010. They are now nearly unusable scientifically.

The SSC is very concerned about the failure of the LRIS-R detectors, and the continued deterioration in performance of one of our most heavily used instruments.

The SSC commends the UCO team for its rapid completion of the new dewar and urges them to replace the LRIS-R detector package in early Dec 2010, if the system is ready.

We note that the performance of the replacement detectors are only marginally acceptable and there will be no spare devices after this.

# LRIS-R

After extensive discussion of potential vendors, the SSC recommends the purchase of two 4x4K LBL Mark III CCDs for use with LRIS-R. This would hopefully provide optimal performance and a spare detector, but there are still concerns given our recent problems with LBL Mark II detectors.

The SSC encourages immediate testing of the Hamamatsu sample chip.

Therefore, the SSC further recommends the continued investigation of devices from commercial CCD vendors and that WMKO consider a future detector purchase for both KCWI and LRIS.



# MOSFIRE

- 7<sup>th</sup> cool down completed
- Optical performance is demonstrated to be excellent. Single focus works for all bands.
- Light leaks discovered from warm snout and coolers. This needs to be reduced well below the dark current.
- Detector works similar to other Teledyne devices. Charge persistence exists but can be managed. Dark current is low: 0.01 e-/s/pixel.
- Flexure is +/- 4 pixels, elastic and predictable to <0.1 pixel. Flexure compensation can just correct this amplitude. Plan is to stiffen detector mount and reduce flexure.

# MOSFIRE

- Cryogenic Slit Unit (CSU)
  - Reliability issues continue due to magnet fracture design flaw
  - CSU Review requested by SSC held (5 Oct 2010)
    - 1 yr for complete redesign and refurb. Not clear that CSEM is capable.
    - Minimum recommendation: disassemble and clean all debris, perform one more cool down with refurbished CSU
  - Project has agreed to disassemble CSU and clean debris
- SSC strongly recommends the following:
  - Flexure should be reduced to an easily correctible level
  - CSU should be cleaned and tested cold prior to shipping

# Flexible scheduling: Overview

- Target of Opportunity
- Cadence or *schedulable* time-critical observations
- Unresolved Issues
  - Incremental operations costs
  - Cross-institutional logistics (trading time)

# Flexible Scheduling: Science Drivers

Targets of Opportunity:

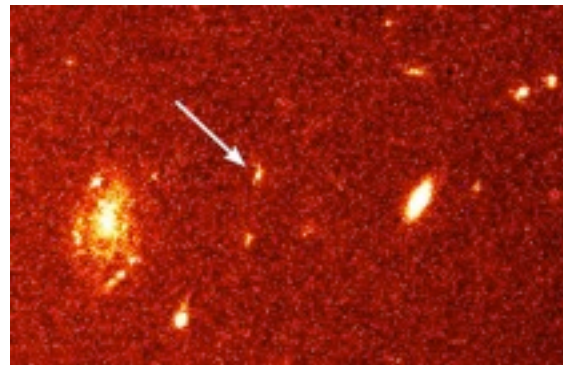
- GRBs, SNe, Lensing Events

Synoptic and time-critical observations:

- Cadence at Galactic Center
- Mercury (twilight)
- Io (time evolution of volcanism)
- Jovian Planets (storms, evolution of impacts)
- Exoplanets (timed RVs)

# Targets of Opportunity Coming from:

- PTF, Pan-Starrs, LSST, SASIR
- New Era of Transient and Explosive Events



# Flexible Scheduling: 2011 Activities

- 2011A
  - In response to time-critical scheduling requests, UC will adopt simple, schedulable, time-specific allocations with “blocks” of at least 2-hour intervals.
  - Stay with one instrument during the night (no additional support from WMKO requested)
  - UC experience will guide future activities
- 2011B
  - SSC encourages a pilot program of multi-institution synoptic scheduling
  - Cost & infrastructure must be minimal for WMKO
  - Observatory directors will consult their community for details of participation

# 2-Hour Blocks: Details

Initially limit the changes to the instrument and to the telescope;

No changes to the tertiary

No entry into the dome or instruments

Limit changes to the instrument, calibrations, etc.

# NSF-Major Research Instrumentation (MRI) Program

- Overview of Possible proposals
  - TOPTICA laser
    - Upgrade to 20W laser (10x return)
  - KCWI
    - Complete construction
  - Deployable M3
    - Enable quick interrupt spectroscopy
- Issues
  - Submitting institution needs to be where most of money will be spent (20% cap on individual sub-awards)
  - Submissions from Caltech or UCSC need to compete to get their respective slots (each institution has a cap of 3 proposals)
  - Requirement for non-federal matching funds (30%)



# KCWI

- Request
  - \$3M from NSF with \$1M match that Chris is working on putting together
- Strengths:
  - Exciting new science
  - Low technical risk
    - Demonstration instrument at Palomar 200 inch
  - TSIP investment & progress (\$1.2M received for 1<sup>st</sup> round; \$1.2M requested from 2<sup>nd</sup> round)
- Issues:
  - PDR will not occur before MRI submission date
  - Challenge of finding matching funds

# KII Laser

- Request:
  - \$3M from NSF with \$1M match from TMT and WMKO
- Strengths:
  - New and better science with current AO system
    - 10x laser return
  - Replace aging current KII laser with a system that is easier and cheaper to operate
  - Strategically important
    - Would demo and reduce risk for future AO systems (NGAO, TMT, and GMT)
    - Partnership with ESO (they buy 4 and we buy 1)
  - Excellent reviews in past
  - TMT still willing to split required matching
- Issues:
  - Declined twice already (1<sup>st</sup> round: no quote; 2<sup>nd</sup> round: program officer encouraged us to resubmit)

# K1DM3

- Request:
  - ~\$1M NSF+matching needed
- Strengths:
  - SSC is excited by the science case
  - Gives Keck new capability in key area of strength
- Issues:
  - Operational discussions not finalized or demonstrated
  - UCO might be stretched to submit via this MRI (matching 'funds' for KCWI, UCSC slot)
  - Design work needs to be completed prior to proposal preparation