Keck SSC Meeting Notes

July 7-8, 2021
Meeting held via Zoom

Observatory Report

- WMKO HQ staff have been back since June 1. Some observers are returning.
- VSQ will be open and WMKO welcomes observers starting of 2021B
- New 15-person Maunakea Working Group constituted by Hawaii House of Reps. Rich Matsuda (WMKO) is sole MKO representative.
  - Schedule is to provide report this year
- MKO Directors working with UH on lease renewal; work planned for 18 mo.
- FY22 plan consistent (includes support for deployment of KPF, KCRM, LFC, and DSI dev.)
- Keck Science Meeting on Sep 9-10 will be hybrid UCSD + virtual. Register soon!
- New comprehensive strategic plan starting. Intend to have draft March 2022
  - Employing Stylus facilitation firm.
  - John O'Meara is leading the science component of the new strategic plan
  - Process is still TBD (details to be worked out in July and early August). Possible KSM breakout session or extra-day meeting.

Observatory report (New Instruments - 2)

- KPF expected to be delivered Jan 2022 and is on or under budget
- KCRM delivery expected to be delivered March 2022 then must be integrated with KCWI. Project is on budget, shared risk observing planned for 2022B
- Laser Freq Comb delivery expected Feb 2022 and is funded and on budget.
- LRIS red detector upgrade has been delivered and is operational - retires risk!
- SCALES PDR planned Dec 2021.
- FOBOS completed successful conceptual design review.

Observatory report (3)

- KCWI python DRP released, compatible with new Data Services Initiative (DSI). Real-time DRP currently being tested at Keck.
  - Back-end infrastructure review this Fall. Front-end UI design early next year.
- WMKO Diversity Equity & Inclusion (DEI) actions: committee formed, statement & code of conduct, training started
- WMKO is recruiting a new Chief of Operations and a HR manager.
- Luca Rizzi (SA and DSI lead) is leaving to become a program director at NSF related to facilities. Mechanical engineering lead Sam Park is also leaving.

Summary of white papers, process, and tools

Total Concept	$	74,134	440
Total Mini Grant	$	70,663	40
Total Phase A	$	584,844	240
Total Proposal Request	$	66,757	340
Grant total	$	796,398	1060

14 total proposals received, requesting ~$800K in total.

Table shows total requests for funding from WP process & WMKO staff hours, broken down by proposal category.

Some projects supported in previous cycles were invited to present updates to the SSC, summarized in the following slides. The remainder of the meeting time was devoted to proposal evaluation, ranking, and discussion of recommendations for support.

AO Future Study Group (FSG) Report

- Presenter: Mike Fitzgerald
- Monthly meetings covering several developments:
  - **HAKA:** MRI pending, and the FSG considers this a priority. The use of PyWFS will provide great improvement. The FSG recommends for the team to continue maturing the project even without a MRI success
  - **Efficiency / stability:** The FSG welcomes the investment and suggests continue involvement with WMKO.
  - **ASM:** enables GLAO wide-field seeing improvement for a number of instrument, and lower background. The FSG should assist in the study of GLAO and add GLAO members to the FSG.
  - **Post-dawn observing:** is an attractive capability but it has not further developed/investigated. The recommendation is for the WMKO staff to investigate its applicability.
  - **ORCAS:** interesting path for AO investment, and the FSG recommends for continued support.
  - **Next-steps:** for instance if HAKA is funded the FSG recommends considering developing a visible camera.
  - **Strategic planning:** the FSG considers having strategic science workshops (OIR universe, exoplanets and enhanced seeing science).

DEIMOS upgrade planning

- Presenter: Evan Kirby
- Upgrade is for entire detector system (detector, dewar, readout).
- Plan had been based on previous (2019) white paper funding to down-select detector and prepare MRI proposal, but asked to stand-down for covid.
- Now asking to SSC consider endorsing fast-track status, and provide money now for the long-lead detector procurement
- Many quality issues in current detectors (functionality, biases and gains, correlated and uncorrelated noise) with about ⅛ of the mosaic currently unusable.
- Detector improvements increase QE/sensitivity, especially in red and blue ends. However, optics limit blue throughput. New detectors have similar format, smaller spatial gap, but larger spectral gap (67 vs. 13 pix). Science team endorsed. Read-out time savings due to lower read noise. Will use Archon controller.
- New dewar will be positioned with hexapod; heritage from ZTF. Dewar design in conceptual stage.

KWFI

- Presenter: Jeff Cooke
- 0.3-1.0um (ugriz) wide-field imager for Keck prime focus; broad science case.
- Studied cost vs FOV for 1.02 deg diameter (standard) and 0.71 deg diameter (economy) instruments, with recommendation to keep standard.
- Studied science vs FOV with recommendation to keep standard.
- Have a proposed solution for accommodating laser launch telescope and a deployable secondary mirror, to avoid the need for top-end changes.
- Current Phase-A request is for a long list of items: management, optomechanical design, detector/cryostat, camera/mount, filter exchange, DRP, documentation.

LRIS2

- Presenter: Brad Holden
- Concept study white paper funded by SSC in 2020
- Basic concept: a 2 channel spectrograph with fixed dichroic
  - Collimator is split into two components, with an on-axis field of view. Allows better packing and image quality, better meshing with future GLAO.
  - Re-uses LRIS-B camera and detectors, LRIS-R detector.
  - Current concept uses grisms with VPH or VBG gratings, achieves very high throughput at both low and medium resolution.
- Community engagement:
  - KSM presentation & breakout (2020)
  - Investigated historical use of LRIS using KOA. LRIS2 design guided by historical use
  - Surveyed LRIS users (~60) and forming science team. Blue throughput highly prioritized.
- Goal for 2022 to be ready for conceptual design review
  - Develop science requirements
  - Finalize optical component selection, optical configuration, mechanical designs for key components (including flexure compensation), wavefront sensing, guiding, budget and schedule
- Examining feasibility of adding polarimetry

SCALES

- Presenter: Andy Skemer
- 2-5 micron integral field spectrograph, optimized for cold exoplanets
  - Well suited for getting spectra of planets discovered by other methods
  - With HAKA can push to planets with T < 1000 K, down to ~300 K
- Two modes: R~200 and R~5000 with smaller FOV
  - Lenslet array for low-res mode, lenslets + slicer for medium-res mode
- Data simulator and DRP have been developed
- Preparing for PDR in Fall 2021.
- Coronagraph stage built, will be installed in dewar & tested
- Slicer prototype being built
- Working on fast detector readouts
- Receiving 2 flight-spare H2RGs from JWST
- Imager is not part of baseline instrument.

SCALES (continued)

- Imaging channel:
  - Basic design completed but this is not part of the baseline instrument, and not yet funded.
  - Can use one of the JWST detectors for the imager.
  - Developing collaboration with Indian Institute of Astrophysics to develop the imager (minus the detector subsystem), to get involved in exoplanet science and prepare for TMT
- Imager options:
  - NIRC2 replacement: 1-5 micron imager with 1 mas pixels, 20” FOV. May be possible to do 40” FOV with a de-magnifier.
  - Alternative: NIRC2 replacement + visible AO, to take advantage of HAKA/ORCAS. JWST detector works down to 0.6 micron.
  - Could build a 0.6-5 micron imager to Nyquist sample shortest wavelengths. FOV 12”.
  - Could still do 20” FOV imaging with OSIRIS, except at LM bands.
  - The finer plate scale is advantageous for the JWST detectors- less sky flux per pixel in L.M bands.
- Need to examine possible loss of wider field thermal IR imaging with NIRC2.
- Using KOA to examine NIRC2 usage.
  - NIRC2 wide field accounts for only 2% of NIRC2 thermal IR frames. Only used ~1x per year.
  - Used for some Solar System targets: Jupiter/Saturn, moons, comets, narrowband imaging
- SCALES team prefers smaller FOV option with visible AO capability.
  - Requesting feedback on FOV options from SSC, and endorsement to move forward with imager

SCALES (3)

- SCALES location options:
- K1 location:
  - Originally planned for K1 to use KAPA
  - Since then, K2 has evolved as the first choice for high-contrast imaging
    - LIGER is being designed for K1
    - Would require K1 AO upgrades to take full advantage of SCALES on K1 for high contrast
- K2 location options:
  - NIRC2 port (AO Direct)
  - NIRSPAO port (AO folded port)
  - If SCALES goes to NIRC2 position, NIRC2 would have to be retired
  - Pyramid WFS works at NIRC2 position.
  - Assuming imager is included, need to consider overlap for Galactic Center astrometry
- SCALES team has prepared a chart of available options & operational requirements for each possible location
- Could start SCALES at one port and then move to NIRC2 port after ~3 years
- Requesting that SSC select a port soon so that design choices can be finalized
  - Optimal science position for SCALES is at NIRC2 port where it can take full advantage of AO upgrades