

# Keck SSC Meeting Notes

## 2024 March 4-5

Pasadena

# Introduction and Review of Actions

Past Actions: (presented by co-chairs) -- accepted by Board.

- SSC recommends that **KSM be held in person** in 2024 with the possibility of a small registration fee as KSM is essential to maintaining the close connection between the community and the observatory, which is critical to Keck's success.
- SSC recommends that **UNO undergo another readiness review** (round 2) and that this review include external experts in UNO at other observatories or critical hardware systems (including reps from UC and Caltech). SSC would like a more thorough presentation on UNO status, including risks and ROI.
- SSC endorses DEIMOS detector upgrade moving forward.
- SSC recommends the **DEIMOS-upgrade downtime (3-5 months) be announced early** to the community (well before impacted semester's call); but left flexible as to the exact time for instrument team preparedness.
- SSC recommends capturing **N\_papers for ToO programs** (as if an instrument).
- SSC endorses continued studies to **replace Ln with mechanical cooler**, etc.
- SSC recommends that the **K2 RTC not be released to operations** and that RTC operations-handover not impact the KPIC install in 2024 Feb. The PyWFS science nights and KPIC shared-risk nights are of high and immediate scientific value.

# Introduction and Review of Actions

## Past Actions: (presented by co-chairs)

- SSC recommends continued investigation of **primary mirror segment phasing issues**, including through the Zernike WFS project. The Zernike WFS is viewed as not yet ready for facilitization; but may be promising for the future.
- The **SSC supported GEO/KASM** and would like to see a written plan to get to CoDR for GEO including deliverables, scope, budget, and schedule ideally before the end of 2023.
- SSC recommends that **future AO proposals follow the standard instrumentation process**, including a proposal readiness review, definition of a science team and engagement of the science team and SSC in the proposal and implementation process.
- The SSC recommends that a **level 1 requirements review**, including instrument scope and capabilities, be **added to the instrumentation process** after conceptual design and before PDR. We recommend that the SSC be presented the requirements and review results for endorsement.
  - Group discussion on this topic at March 4 meeting centered on whether SSC members can/do participate in reviews? Will be some follow-up on this.
- SSC recommends that at the end of each instrument/AO **review, the SSC receives a report** on the scope, status and review results.
- SSC needs to be prepared to be do interim review and approvals between meetings.

# Observatory Report - Leadership

- Welcome to new (non-interim) director Rich Matusda
  - highest importance is usual emphasis on operations and development
  - other priorities will be guided by strategic plan
  - gaining understanding of overall budget
  - need to position for resiliency in face of TMT uncertainties on maunakea
  - working on strengthening myriad relationships
- Impending senior-level retirements:
  - Randy Campbell (observing support lead) ⇒ Lyke + Jordan
  - Peter Wizinowicz (technical development lead) ⇒ Bouchez
  - Jason Chin (engineering lead) ⇒ ??

# Observatory Report - Hawaii Issues

Discussions around:

- Respect for maunakea
- Nurturing relationships = “moving at the speed of trust”
- New ED for the MKSOA - John DeFries

# Observatory Report - Major Hardware Issues

- K1 pier repair
  - 1st planned downtime Mar-Apr 2025 (6.5 weeks)
  - 2nd downtime: Aug-Sept 2025 (also 6.5 weeks)
  - same issue does not affect K2 due to various improvements between their construction
  - observatory looking into other work that could be done during this shutdown
- Earthquake (5.7m) on 12 Feb 2024
  - No telescope damage
  - However, K1 shutter and K2 dome drive had issues due to power outage and resulting damage to power supply. Full repairs underway.
  - Overall kudos to summit staff for response during/after earthquake (witnessed first-person by SSC member Fitzgerald)
- UNO
  - Phase-I implemented (all 3 people present, but using tools as if not on site)
  - Phase-II beginning June (only 2 people present)
  - Phase-III = II+3mos
  - Will have an UNO review
  - **SSC Discussion: define metrics; add UNO impact to post-observing form; include cybersecurity expert on review team, add “extreme situations” (e.g. power shutoff; earthquake) considerations.**

# Observatory Report - Major Projects Update

## - SCALES

- Budget projections under cap.
- Slicer design handed off to vendor; big milestone; critical path. Detector subsystem is behind schedule; not yet on critical path. Forward optics in hand for measurement and characterization, filters in hand.
- Plan to ship in July/Aug 2025, commissioning in fall, probable 2026A availability.
- Team will update in full at July 2024 SSC

## - HISPEC

- Working to transfer NASA detectors; FEI fiber injection unit soon to undergo review.
- Shipping by July 2027

## - NOTE: when SCALES goes in (and HISPEC plate), no more NIRSPAO.

- **SSC recommends including “NIRSPAO last call” in 2025A and 2025B proposal calls.**

## - PyWFS

- PyWFS is no more due to hardware failures, likely related to KPIC work.
- 45% of NIRC2 science was being done with pyWFS.
- Can we replace the detector system?, WMKO in contact with UH to identify a replacement, replacing detector would not reduce risk, facilitating the system would require significant risk reduction efforts.
- **SSC recommends a report on what happened. Scope: Causes of failure (process, decision making, communication); lessons learned for future. Due: 2024 May.**

# Observatory Report - Major Projects Update

- DEIMOS upgrade
  - Current cost projection is within budget and anticipates 20% contingency use
  - Critical path remains the dewar, hexapod is next, detector delivery is on track for April
  - All long lead items are purchased, hexapod construction complete and under test at vendor, dewar delivery expected in March 24
  - Instrument will be offline starting Feb 2025, expected 2 mos for re-commissioning.
- LRIS-2
  - PDR planned for December 2024
  - Technical requirements are moving ahead quickly, many pieces of prototype hardware being acquired; CSU and camera designs complete.
  - Highlight value of mainland engineers visiting WMKO directly to discuss hardware.
- KASM - Keck Adaptive Secondary Mirror
  - CoDR scheduled for April 24, 25
  - Technical update later in KSSC meeting; actuator trade downselect process agreement signed on to by development team.
  - Goal = deliver a functioning secondary mirror that works in a seeing-limited mode; does not need to work in an adaptable or deployable mode. KASM will be compatible with all plans for GEO, LAVA, CRAGS but they are not part of basic KASM effort.

# Observatory Report - Major Projects Update

- Wide Field Imager
  - ARC CRC-P awarded for R&D
  - PI has been visiting partner institutions, planning science workshop, trying to find community support.
  - Top end weight testing complete to reduce technical risk, agreement in place the WFI can use the Subaru HSC filters
- Liger
  - Construction schedule has officially started.
  - Construction focused on systems common to IRIS and Liger, H2RG
- Cryocoolers
  - Funds have been provided to SSL and Caltech for KPF and KCWFI coolers, KPF coolers have been ordered
  - KPF cooler install Q1 FY25, KCWI install Q2 FY25
- FOBOS
  - Workshop being planned for March 25/26 2024
- Frequency Combs
  - WMKO participated in recent workshop, frequency combs are a future need for Keck PRV

# Instrument Suite Evolution Working Group Update

Group had kickoff meeting + open session at Keck Science Meeting in Sept 2023  
have been holding biweekly meetings since then

Info gathering: (1) Broad community survey done last fall, (2) Metrics from WMKO

End product: retirement plan for each of the current instruments + hibernation plan

Members from CIT, UC, NASA, Swinburne, UH & WMKO, spanning broad science

Inputs to process: 2023 Strategic Plan, WMKO instrument metrics & staffing needs, Kulkarni (2016), community survey, TAC demand, etc.

Community survey: 127 responses (along with requests for Top 10 PIs & observers for each instrument)

Synthesis of info: science relevance + current/future demand + technical aspects + competitive landscape + decommissioning aspects → grades + decision tree

# AO Development Projects (1)

Peter Wizinowich moving to part-time role in Oct 2024 (e.g. on HAKA)

Bouchez is currently focused on taking on KAPA, GEO/KASM & Visible MCAO

AO development group priorities:

- Maintain/improve AO system performance & reliability
- Complete KAPA, HAKA, SCALES, HISPEC & Liger
- Implement 2035 strategic plan initiatives
- Engage with US & international groups: coordination, collaboration, etc.

RTC Upgrade: Keck-1 used for science since Sept 2023, Keck-2 on-sky engineering on-going (previous problems believed due to Boston DM problems). Keck-2 science readiness review planned in late March 2024.

KAPA (main current focus): pupil relay optics having issues (added ~250 nm non-common path WFE aberrations); 4-LGS asterism commissioning in April; LTAO on-sky tests in August 2024.

# AO Development Projects (2)

HAKA: 2844-actuator DM development on track on ALPAO; WFS & DM mount design underway at WMKO; PDR planned on April 17 (FDR for optics)

ORCAS: successful engineering test on Jan 24 & Feb 20 using existing NASA geosynchronous satellite (have NIR lasers for communication - pointed at WMKO & sensed by PyWFS)

GEO & KASM: regular meetings between teams

- Caltech is leading simulations of GLAO performance

- UCSC is managing conceptual design reports from AdOptica & TNO

  - to be delivered in March, with CoDR for both designs in April

  - related: 1st-gen IRTF adaptive secondary delivered in Feb, on-sky in Apr

Visible MCAO: team meeting monthly, focusing on simulations to determine performance simulations & flow-down requirements, selected a “MAVIS-like” architecture with contiguous 2' FOV, SR~20% @ V-band in median seeing (cf: MAVIS SR~20% in R or I-band).

# AO Development Projects (3)

Overall, AO Dev group is juggling many projects (including things not covered here)

Plan to increase effort on “AO Refurbishment project” for performance & reliability

- LBWFS performance and reliability improvements
- AO enclosure temperature reduction
- Conversion of operations tools to Python
- Tracking delivered image quality versus time

**SSC recommends that AO refurbishment project be raised in priority.**

# HISPEC Update

Summary: single-shot  $R \sim 100,000$  YJHK spectrograph, AO+fiber feed  
limiting mag  $\sim 15$  for  $S/N > 30$  per resel in 4 hours  
relies on HAKA to achieve full performance, along with 2 laser-freq combs  
will be in Keck basement, with temperature control

Caltech updates: agreement completed on long-term loan from NASA for two H4RG-10 detectors; long-lead time order placed for fibers; extensive testing of fiber-switching mechanism

UCLA updates: spectrograph design progressing well (early June review planned); electronics rack prototype complete

UCSD update: CAL system design.

WMKO update: heat exchanger, observatory interfaces, cable routing

First light in  $\sim$ Nov 2026, operations handover in  $\sim$ Apr 2027

# 2024 KSM Logistics

- Will be in person at Caltech, potentially the week of Sept 9
  - Default in-person only (no online presentations). Can stream talks online.
- Request to have a Swinburne representative on the SOC
- Registration fee TBD, to help cover costs for an in-person meeting
- Discussed having a splinter session about the instrument evolution activity (Regardless of whether or not a decision has been made – there's benefit to providing details about the thoughtful process that's been undertaken.)
- **SSC reminds the Directors to appoint KSM co-chairs ASAP.**

# Planning for Phase A Call

- It's back!
- Planned funding ~ \$175k
- Call language and guidance to be decided at May SSC meeting.

# DSI GUI Feedback Discussion

- Most work to date on DSI has been on backend infrastructure, which links the other main DSI components (observation planning, observation execution, data reduction, data archiving).
- Engineering (first version) GUI focused on interacting with the backend infrastructure.
- GUI feedback makes clear that modifications are needed. New efforts are focusing on a workflow-based approach. (Make the sequence of required actions clear to the GUI user.)
- There are opportunities to learn from other facilities and people who use other facilities.
- Expect a couple of decision points prior to deployment. Exact timing depends on the nature of the user feedback.

# DRP community approach and data infrastructure

- WMKO receives DRPs from the community
- WMKO deploys DRPs for operations and integrating into KAO
- WMKO doesn't add functionality. They track suggestions, but DRP authors alter functionality

# AO FSG → New AO Working Group

- Mike Fitzgerald presenting on behalf of AO FSG.
- Overall recognition that implementation will require focus by the community
- Requires ongoing availability of scientifically competitive AO capabilities
- New AO WG required
- Draft charter to evaluate Keck AO projects operations and procedures, prioritize activities and make recommendations.
- Assist the Observatory and SSC in assessing the technical feasibility and performance predictions of AO projects
- Represent the interests of the Keck AO user community.
- Keep Observatory and SSC apprised of scientific and technical AO developments and connect with the community
- Bring effort to the table to improve all aspects inc. documentation to help ease of entry to the AO systems at Keck.

# AO FSG

Working Group Deliverables:

- March SSC meeting recommend initiatives for next fiscal year for budget planning.
- July SSC meeting recommend Keck AO priorities for the next fiscal year and evaluate any AO proposals.
- Nov SSC meeting - operations and performance will be discussed along with the community feedback.

Desired membership broad - spanning whole breadth of AO usage (want all domains), practical experience with multiple AO experience, understanding AO technology and operations, links to other AO communities, range of Keck communities should be represented, inclusive of non AO users whose science may benefit.

Willing to devote ~1 day/month, on average, beyond AOWG meetings.

ESO connection is desirable.

Will aim to gain metrics about AO performance to evaluate return on investment to the community. Are we gathering the correct data currently to evaluate performance? Group will evaluate.

Draft charter is in SharePoint site.

Understanding wavefront error is an important activity. Observatory doesn't have the resources so will fall to the group.

# AO FSG

3 co-chairs, Antonin Bouchez + 2 selected by SSC

- **SSC recommends 1 co-chair be an SSC member.**

Process for selecting group members:

Solicit from broader community, self-selection.

Initial 2 year period starting August 2024, monthly meetings + topical meeting attached to KSM.

Goals are inclusivity, good balance between development and operations.

**SSC members should submit co-chair nominations by 2 weeks before the 2024 May SSC meeting.**