SSC Report

April 25, 26
WMKO HQ WAIMEA

Jean Brodie and Judy Cohen
SSC co-chairs

Thank you Judy and Shri!!

The Keck SSC wishes to thank Judy Cohen (SSC co-Chair) and Shri Kulkarni (COO Director) for their tireless efforts on behalf of the Keck Observatory over many years. Their inspired leadership has been crucial in maintaining WMKO's position at the

forefront of ground-based OIR astronomy in an increasingly competitive landscape.

Review of action items 1 - 3 from February 2018

- Facilitate organization of review of precision radial velocity landscape
  - Effort underway led by Lynn Hillenbrand to host a workshop in August; need a budget to support participant travel

- Meeting to discuss LIGO follow-up strategies for fall 2018 LIGO run
  - UC, Caltech, UH, and NASA expect to have GW ToO programs. SSC proposes to convene a meeting of representatives from each partner (not active GW researchers). Membership recommendations should be given to Hilton within a week. Two major topics:
    - Groups leading GW ToO programs at Keck should discuss how to plan for triggers and possible data sharing, within the framework of the current ToO policies. The goal is to maximize science productivity while minimizing conflict between groups. Ideally all GW ToO groups would agree to a set of rules not requiring any observatory policy changes.
    - A separate question is whether there is a need to revise ToO policies or data rights policies in order to take full advantage of the science opportunities in GW followup. Both groups should advise on the need to make exceptions or changes to standing ToO rules.
- New model for instrument development
  - Marc Kasis presented a new model for process and SSC members volunteered to give him feedback

Review of action items 4 - 7 from February 2018

- Twilight observing trial: communicate to community
  - Done and requests from UC & NASA in 18B

- Request to schedulers to have laser checkouts done at beginning of night if possible
  - Was not discussed

- Improve audio for remote participants at SSC meetings
  - Tried out zoom for this SSC meeting but still need to explore options for audio/microphones

- Ensure fits metadata for slitmask data should include object coordinates
  - Was not discussed

Observatory Report: Governance & Staffing

New partnership agreement between UC and Caltech signed by their Presidents.

SSC update:

- Judy Cohen rotating off, Chuck Steidel coming on as new CIT co-chair;
- Shri Kulkarni finishing as COO director; Jonas Zmuidzinas begins 1 May;
- Wen-Fai Fong joins as Northwestern rep

WMKO staffing:

- Many key positions that were open have now been filled: 2 support astronomers; 2 adaptive optics specialists, 3 software engineers, 1 senior systems engineer, summit staff.
- Lots of turnover in recent years with ~50% of WMKO staff hired in last 5 years
- Recruitment for Chief Scientist position ongoing
- New SAs are Alessandro Rettura and Chien-Hsiu Lee

Keck Scholars Program: reviewing applications for Year 2, expecting ~7 scholars

Keck Science Collaborative: new privately funded program, to benefit SA research

NASA IRTF/Keck User Group (NIKUG, formerly MOWG): interest in twilight observing and quarter-night scheduling

Observatory Report: Safety & Operations

Safety incidents

- Multiple minor accidents this year, which could have been major (KCWI Cryo Spill, K1 DM3 installation, glycol leak onto K1 primary mirror)
- Underlying issues: increasing complexity of observatory ops, staff turnover and accompanying loss of experience, historical ad hoc practices
- Motivates new major push to improve overall safety & changes in approach
  - Short-term fixes: New safety officer, compliance register, safety management tools
  - Long-term changes to methods & culture

Operations issues

- K1 azimuth axis: increasing number of faults at certain angles, investigation in progress, slew speed has been reduced (1.0 -> 0.6 degs/sec)
- K2 dome water dripping: due to condensation & ice melt during unusual stretch of poor weather, repair in progress
- K1 Ops shutdown (2+5 days) in August 2018 for needed grout repairs and secondary mirror recoating.
- Plan OSIRIS service mission in 2018B to make imaging and spec parfocal.
- Possible service mission for NIRSPEC in 2019A

Observatory Report: FY19 planning

Current priorities are:

- Routine operations has highest priority (as always)
- Complete existing projects
    - AO performance
    - TDA tools and processes
- Improve safety culture
- Address recommendations from 2017 Operations Review
- Sustaining expertise and succession planning, knowledge transfer.

- KPF and KAPA are not in the plan, since funding not yet secured.

WMKO cannot fully support all projects that were initially identified for FY19. In particular, major effort on Unattended Night Operations delayed from FY19 to start of FY20.

SSC was concerned by the number of projects: 22 “key” and 17 more “best effort”. Not all are started. WMKO strives to allocate staff such that each person is working on no more than 2-3 projects at a time.

Instrument refurbishment funding:priorities informed by metrics and vetted by SAs & instrument engineers

- PCS upgrade, replace obsolete NIRES guider camera, etc.

Observatory Report: Project updates

Segment repair: 32 done, 21 installed. Expect to finish on budget and with only a modest schedule delay (<8 months).

TCSU: nearly fully released on both telescopes; can still revert if needed.

K1 DM3: commissioning ongoing through 2018A with significant weather problems plus hardware/software issues; should be ready for operations in 2018B.

KCRM: PDR planned for Sept 2018 (WMKO on schedule but UCSC and CIT are not). Project contingency is not yet fully funded at the desired 30% level. Science Oversight Committee formed and has met.

KPF: Proceeding with detailed design.

AO Projects: RTC vendor selected, TRICK operations handover underway, AO optimization is resolving telescope-generated speckles (which affects PSF-R).

Two pending NSF proposals.

Observatory Report: Maunakea update

TMT Board recently delayed site decision for TMT.

Two astronomy-related bills pending in state legislature are unlikely to go forward during this legislative session.

Instrument overview

- SSC thanks the SAs for their excellent presentations at this meeting and for their tireless support of the Observatory
- SSC appreciates the detailed instrument metrics and reports
- SSC also appreciates evaluation of all instruments for TDA readiness
- HIRES, LRIS, DEIMOS, NIRSPEC, NIRC2 (NGS, LGS) most popular instruments.
    - New instruments KCWI, NIRES are popular and working well
    - ESI is least used but still produces publications
    - OSIRIS has the fewest publications 2014 – 2017. DRP issues?
    - SSC will continue to monitor publication rates per instrument per night
- 2018 Winter weather losses far in excess of long term trend (50% loss over last 6 months. 76% in March and April)
- DEIMOS consistently highest in instrument faults but less than 4% lost time in 2016 & 2017

Instruments-1: AO Operations

- Several AO projects underway to improve image quality, reduce faults, improve operations
  - Cleaning of tachometer addressed image blurring and elongation problems
  - Still understanding issues with primary mirror “terrace mode” producing speckles in AO images.
  - LGS steering an issue on both telescopes but being addressed
  - LBWFS done with MAGIQ on both telescopes now with recent improved results
- Laser faults at 6-7%
  - Laser traffic and aircraft shutdowns very low
  - Remainder split between laser launch/steering, telescope and AO bench
- TDA readiness
  - K1: NGS only due to start up time
  - K2: 4-6 hours of startup could be reduced by running continuously.
    - Increased power cost. Pump lifetime and vibration effects on other instrument potential issues
  - Laser clearing house: WMKO implementing full sky tiles could help
  - Looking at low cost renewals for computers, laser components, etc
- New AO Ops scientist (Juan Carlos Guerra) starting in July

Instruments-2

- ESI (Lyke)
  - Operating well for small but active community.
  - Considering letting instrument warm up between usage blocks. Save on LN2 and labor
  - TDA readiness: single setting / easy setup, but must be on telescope and scheduled (Cass)

- OSIRIS (Yeh)
  - Imager and filter wheel upgrades complete. Waiting for final commission due to weather losses
  - Work in 2018B to make imager and spectrometer parfocal
  - TDA readiness: available in NGS mode. LGS not available
  - Creating web-based OOPGUI preplanning tool
  - Carlos Alvarez being trained to support OSIRIS

Instruments-3

- HIRES (Doppmann)
  - Stable operations, highly popular > 100 nights / year
  - New deuterium lamp for improved blue dome flats planned for next year
  - TDA ready but must use installed cross-disperser
    - Easy to setup using existing configuration file system
    - Calibrations all internal --- can be done off telescope

Instruments-4

- NIRSPEC (Doppmann)
  - Usage remains high: 75-100 nights/yr for combined NIRSPAO and NIRSPEC
  - Reducing faults and problems with maintenance:
    - Server crashes mitigated by careful cleaning of fiber links
    - Eliminate spectral artifacts by cleaning foreoptics and annual pump out of H2O
  - Test of Laser Frequency comb in September
  - TDA readiness
    - Ready to go on-sky in less than 15 minutes.
    - Efficient instrument setup via configuration files
    - Calibrations all internal --- can be done off telescope
  - Upgrade
    - In progress with spectrometer and SCAM upgrades
    - Upgrade will start in August and planned to be back to operation in time for December run on Comet Wirtanen
    - May need 2nd servicing mission for SCAM upgrade in 2019A

Instruments-5

- LRIS (Rettura)
  - Number of upgrade tasks in progress: GUI interface, blue arm shutter, autoslit generation software, focus GUI
  - Deferred 5th grating port and performance monitoring
  - TDA readiness needs improved focusing which depends telescope positon, filter etc.
    - Need to identify a limited TDA configuration, also develop procedures to optimize focus and obtain calibrations
  - Ageing and lack of spares becoming a serious issue
  - Data reduction pipeline a future project at UCO/Lick

- MOSFIRE (Walawender)
  - Upgrades completed for differential refraction correction, confirmation of on-sky performance after accident
  - Updated DRP with new Python 3 release
  - Time lost to rotator/TCSU issues appear to be resolved
  - TDA readiness is good but CSU may need to be re-initialized (45 min) if not used “recently”

Instruments-6

- DEIMOS (Alvarez)
  - Installed new blue grating, commissioning with TCSU. New LN2 autofill system for longer cryo life (7 vs 1.5 d)
  - Plans to upgrade/replace detector videoboard, obsolete rotator computer and controller
  - TDA readiness: only if already on telescope. Need tool to inform potential observers of that night's configuration. Need on-sky focus before TDA observation
  - Future plans include modernizing mask design software, train a new SA, improve rotator control

Instruments-7

- NIRC2 (Alvarez)
  - Commissioned w TCSU and working well. Yeh will be trained as second SA.
  - Investigation upgrade path for NIRC2 detector electronics, high performance M-band vector vortex coronagraph.
  - TDA readiness: ready to go but NGS only. Need AO calibrations only every few days so no special calibration effort

- NIRES (Gomez)
  - Successful commissioning. NIRES now operational on the sky
  - Identified and fixed source of vignetting, dewar leak
  - Would like to improve LN2 procedure (change to cryocooler).
  - Facilitization: Upgrade old guide camera to MAGIQ
  - Plans to make Barlow DRP available on-line soon, change guiding to use H1RG SCAM
  - TDA readiness: could be ready every night since always cold.
  - Request comparison with NIRSPEC and X-Shooter (also last page)

Instruments-8

- KCWI (Rizzi)
  - In operations! 30 nights of shared risk and 19 nights of regular time since Aug 2017
  - Release of commissioning data to Keck GitHub site (send also to KOA)
  - Instrument is stable and reliable (2% fault rate)
  - Recovered from cryogen leak in autofill system
  - TDA readiness:
    - ready to go in 15 minutes after on-sky focus sequence.
    - Web configuration tool available
  - Future plans to generate scripting language for complex observing sequences

Instruments-9

- KOA (Rizzi)
  - Over 200 citations to date
  - KCWI data available for PI download, public release in October 2019
  - Coming soon: NIRES and NIRC2 PSF reconstruction
  - Contributed datasets coming. Contributed dataset policy for future SSC discussion
  - Adapting private HIRES/PRV pipeline for general use through KOA. Developing specific observing procedures for use w. pipeline

Instruments-10

- Visiting scholar program had 21 applicants (factor of 3 oversubscribed). Application process always open. 7-8 people per year funding secure for next 2 or 3 years (Rettura)
- Mainland Observing
  - Remote observing leveling off at 55% of total time mainland only) with 70% with mainland + eavesdrop
  - Aging infrastructure needs maintenance or replacement:
    - ISDN backup --- nothing provides simple replacement. Alternative might be cheaper but might result in to many remote sites which might lack appropriate level of staff and security. Internet failure mode is one internet failure per year
    - Polycom---shifting from polycom → Zoom for remote communication. Need license to host meetings and decent microphones/cameras at client end. WMKO to provide a list of approved cameras and microphones. Note, can call Zoom from Polycom site
    - VNC sessions—transition to Linux servers. Update to HD monitors on instrument by instrument basis. Fewer individual screens. Simpler to manage.
  - TDA readiness: ready to go on from Keck side. Individual sites need to assess their own readiness

Protection of dark skies on Maunakea: Overview

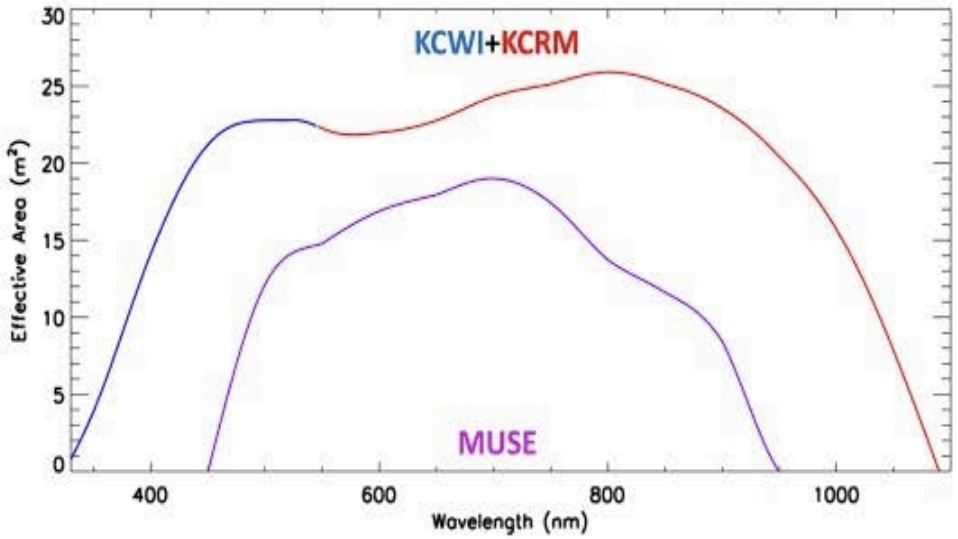
- The SSC thanks Richard Wainscoat (UH) for his very informative presentation on lighting ordinance changes that are afoot, the complexities surrounding this important topic for Astronomy, and his tireless efforts on this.

KCRM: Science Oversight Committee (KSOC)

- KCRM Science Oversight Committee (KSOC) was constituted and met in April
- Erika Hamden is KCRM project scientist; Shelly Wright is chair of the KSOC
- Reviewing requirements to optimize science within cost cap
  - This includes recommending descopes, if necessary
- Reports to SSC and makes recommendations to KCRM team
- Will meet 3-4 times per year
- Evaluating the existing science case and relevance to MUSE, JWST
- Recommended creating an operations concept document and improving the science requirements traceability matrix

KCWI vs MUSE

- More Sensitive*
- Wider bandpass
- More flexible



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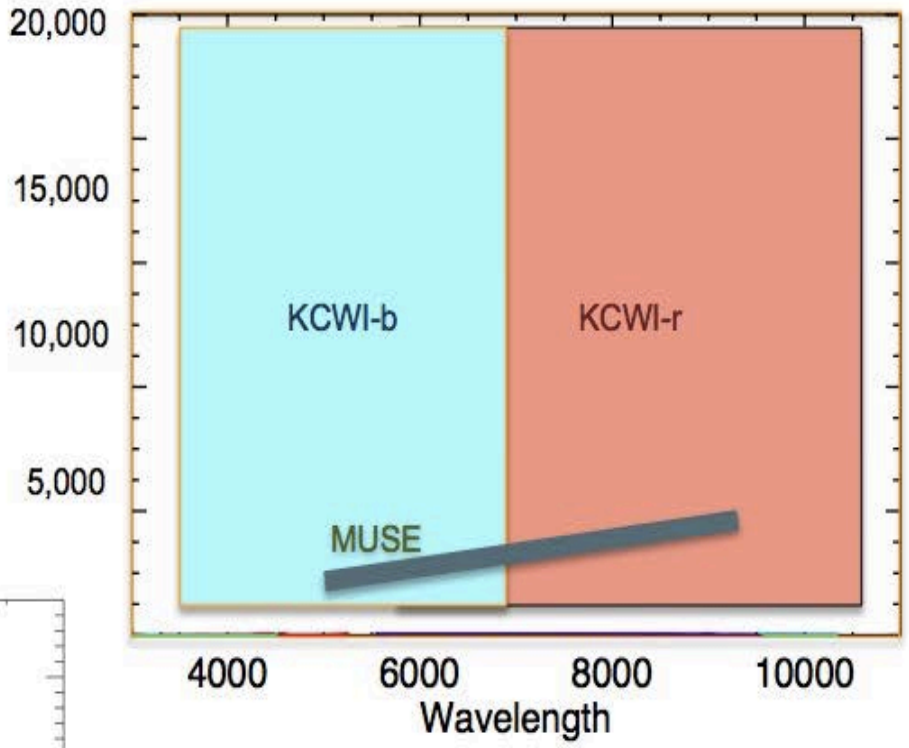

* includes primary mirror area difference

Instrument Proposal Development: Motivation & History

- Board and Director mandate a new approach to cost estimates and instrument timelines
  - Recent instruments illustrate cost overruns and schedule delays, typically accommodated by delay/cancellation of future instrumentation
  - This approach is no longer viable for instruments costing in excess of $20M – typical cost of a major new instrument on 8m-10m class telescopes
- White Paper funds develop instrument concepts
  - Started in 2006 with Brodie and Soifer SSC co-chairs
  - Major instrumentation projects: 4/5 approved by NSF
  - Continuous improvement projects: Generally led by PIs inside WMKO
  - Overall 19/70 submitted projects have been approved by the SSC
  - Total support amounted to ~$150K (2017) and ~$125K (2018)
- Not every successful project goes through White Paper process.

Instrument Proposal Development: Advantages and Deficiencies

- Advantages:
  - Funds provide motivation for development team, graduate student hires, additional support from external funding
  - SSC Review ensures alignment with overall strategic plan
  - Provides mechanism for major instrument initiatives
- Deficiencies:
  - PI expectations are not clearly defined (reporting times, award duration, end products, etc)
  - Funding issues: Majority allocated to science case development, underfunded for large instrument concept studies, no external budget or schedule review.

Instrument Proposal Development: Budget Recommendations

Example budgets of past proposals demonstrate that detailed budget justifications, outlining schedules and deliverables, are necessary.

- Keck will organize proposal reviews (red) teams and budget reviews by the Observatory
- Require budget justification in white papers/conceptual design proposals outlining time and effort
- Define process and PI expectations through online documentation
- Maintain flexibility of funding between white paper and design study proposals

Instrument Proposal Development: Schedule Recommendations

- Proposed Instrument Incubation Cycle (IIC) by M. Kassis provides concrete timeline and plan for instrument development.
- SSC provides multiple points of approval over a 2.5-yr period starting in June
- May allow PIs to enter at later stages or fast-track only if applicable.
- This process is not just about funding, but also about timing, guidance, mentorship provided by the Observatory and the SSC to proposing teams.
- Use Keck Science Meeting to advertise the IIC and process
- SSC to work on online documentation including IIC (e.g., schedule), white paper call, PI expectations, and funding. To be available prior to June.
- Reassess timeline w.r.t. NSF proposal deadlines

Call for White Papers

- Draft call for white papers ($125K/proposal, $250K/SD), which follows Kassis' proposed instrument development process is available online.
- It includes a link to the online guidelines for Keck instrument development
- The call is for both new white papers and system design proposals
- Due June 8, 2018
- The call encourages projects that reflect the Keck Strategic Plan

Recommendations to WMKO

- Request to schedulers to have laser checkouts done at beginning of night if possible
  - Item from Feb 2018 not discussed at April 2018 meeting
- Improve audio for remote participants at SSC meetings
  - Tried out zoom for April 2018 SSC meeting but still need to explore options for audio/microphones
- Ensure fits metadata for slitmask data should include object coordinates
  - Item from Feb 2018 not discussed at April 2018 meeting
- SSC wishes to monitor publication rates per instrument per observing night and requests that WMKO present this information at a future meeting
- Consider modifying MOSFIRE operations to maximize lifetime of CSU: May want to switch between what slit bars are used for common configurations every few years
- Consider adding weather related information to KOA such as seeing, humidity, cloud cover, WxCenter Maps, etc. In some cases put into headers, others make searchable in UI queries

Action Items-1

- Prepare comparison of NIRES, NIRSPEC low RES, and MOSFIRE sensitivities in at least 1 band
- Prepare comparison of NIRES and X-shooter sensitivity at all NIRES wavelengths
- TDA readiness of all instruments be summarized in a table on a TDA page
- Present metric showing load of prioritized tasks on staff to ensuring efficiency and avoiding overload.

Action Items-2

- By May 4th each partner will provide WMKO Director with the name of its GW TDA advisory committee representative
- SSC will consider suggestions for augmenting the KCRM KSOC with other experienced instrument people
- SSC members to give feedback to Marc Kassis on his new model for instrument development
- SSC/Kassis will send out White Paper announcement, interface with potential PIs, SSC co-chairs will assign reviewers in advance of June SSC meeting,
    - Think about specific areas that the SSC would like to promote, give potential proposers a heads-up to prepare.
    - Re-evaluate pros and cons of relative phases: Initial conceptual study phase is too long (1 yr) while proposal development process is too short. Do reviews always have to be in June? (adv = allows for more flexible timeline; disadv = reviews are constantly staggered and funding situation may not be clear).