

SSC members report

April 11 & 12, 2019

Keith Spaulding Building, Caltech

Jean Brodie & Chuck Steidel
SSC co-Chairs

Observatory Updates: Instrument + ToO + FY20

NIRSPEC post-upgrade: SPEC & SCAM detectors ongoing work to reduce noise issues; ongoing software issue with SCAM guiding: sometime bad nods

NIRC2 upgrade (March 2019): replaced L/M-band vortex coronagraph; added new K-band vortex coronagraph, new pupil mask & Wollaston prism (though half-wave plate not available yet)

OSIRIS post-upgrade: Imager is slightly vignetted by 1 or 3 TRICK dichroic; image sharpening has not worked on Imager or Spec since upgrade (problem now fixed) - all minor issues

KCWI: small leak in dewar, will have to ship to original vendor for re-design

Observatory Updates: Instrument + ToO + FY20 (con't)

SA: “Support Astronomer” is now “Staff Astronomer”

LIGO O3 run: 2 events (BH+BH) so far, so no Keck Partnership ToO triggered yet

FY20: start of Data Services Initiative (1.5 FTEs currently)

- DRP framework (how contributed pipelines should be built)
- DRP integration: PyPit
- KOA integration: real-time ingestion of pipeline results

Community is building the pipelines, WMKO Is providing the framework

External funding (e.g. NSF/NASA/private) would allow this process to go faster

Update on proposal development process

- The discussion was meant to clarify the primary deliverables for white papers and Phase A proposals.
 - Is it worth matching these steps to their NASA analogs?
- Notional deliverables for completed white paper studies:
 - mature science case, conceptual design, notional budget and schedule to complete project
 - Phase A proposal (if warranted): 10 pages for instrument description and preliminary full scale budget, 1-2 pages for Phase A request (budget, schedule, deliverables, references)
- Notional deliverables at end of Phase A:
 - Is the request for WMKO money for further design or for crafting a proposal to a funding agency?
 - Concept design document
 - Science case
 - Instrument design, including requirements that flow down from science goals and digital models (e.g., CAD)
 - Observatory interfaces
 - DRP design
 - Management plan (team and work breakdown, risk assessment, cost breakdown, schedule) including Microsoft Project file
 - Funding plan, including which funding call, any cost sharing, and contingency
 - Where applicable identify the “threshold mission” and then reach goals.
 - Identify the strategic relevance, e.g., in the context of the 2016 Strategic Plan.
- At the end of the meeting, the SSC decided that the current call for proposals required only minor changes.

Liger Status and Cost Justification

- Liger MSRI-2 full instrument build pre-proposal submitted to NSF in March
 - Full proposal due August 2 if invited
- Continuing instrument design work and science case development
 - Includes purchasing some Liger components
- Liger duplicates the TMT-IRIS spectrograph design and leverages the design and cost maturity of IRIS, taking advantage of millions of \$ of development.
- Reduced Liger cost relative to IRIS due to much simpler ancillary subsystems
 - Much lighter Liger
 - Liger dewar does not rotate
 - Single Liger H4RG detector vs. 4 in IRIS
 - No on-instrument wavefront sensor for Liger
 - Simpler Liger dewar and electronics cooling systems
 - No Liger ADC
 - Liger adapting OSIRIS handling cart vs. a new system for IRIS

Liger Relevance to Keck Strategic Plan

- New instrument that takes advantage of large WMKO investment in AO + KAPA
- Keck strategic plan calls for a new AO IFS that goes below 1 micron, a capable AO imager, and to leverage the TMT IRIS design.
- Liger team has assessed relevance to 9 strategic plan science areas ranging from first-light galaxies to exoplanets.

Science Topic / Instrument Need	NIR Imager	NIR IFU	NIR Multi-object IFU	Vis Imager	Vis IFU	L-band IFU	IR MKIDS	NIRC2 Polarimeter
Dark Matter & Energy	X	X		x	x			
First Light Galaxies	X	X		X	x			
High-z Galaxies & AGN	X	X	X	X	x			X
Nearby Galaxies	X	X		X	X			
Super Massive Black Holes	x	X		x	x			
Stellar Populations in MW & Local Group Galaxies	X	X	X	X	X			
Galactic Center	X	X	X			X		
Time Domain Astronomy	x	X		X	X		X	
Star Formation & Stellar Astrophysics	X	X	X	X	X	X		X
Exoplanets	X	X		X	X	X	X	X
Solar System	X	X		X	X	X	X	x

- This is an immensely better OSIRIS but not really something new.
- No “killer app” identified though: A full proposal should highlight key science advances
- Liger + SCALES could replace most NIRC2 capabilities, potentially allowing its retirement

NIRSPEC laser frequency comb

- Science goals: planets around young and cool stars, planets in binary systems, brown dwarf masses
- Competition/collaboration underway: Subaru/IRD, CFHT/Spirou, Calar Alto/CARMENES, Palomar/PARVI, Keck/NIRSPEC, Keck/HISPEC (future)
- NIRSPEC+LFC provides fast-track to NIR PRV* for Keck community, and it's a stepping stone to HISPEC.
- NIRSPEC bench needs temperature stability of 3-10 mK (currently stable to 10-15 mK)
- Plan has commissioning + science start in 2021A (quite fast, though many aspects have already been done before by this team)

* near infrared precision radial velocity

Tech demonstrator capabilities

- Example: pyramid wavefront sensor. Some instrument team members are requesting to use these demonstrators through their respective TACs
- There is concern that such allocations could cause unanticipated burden on WMKO resources.
- WMKO has no resources to support demonstrators for open use.
- Sometimes the demonstrator team requests time to supplement engineering time, which is valuable for completing the commissioning+characterization. In such cases, WMKO needs to be consulted early in the proposal process and reserves the right to disallow time allocations if it cannot support them.
- There is a distinction between tech demonstrators and instruments intended to be facilitated. In particular, instruments intended to be facilitated should be given sufficient engineering time without having to resort to TACs.

AAS in Honolulu, 5-9 Jan 2020

- For the purposes of larger community engagement, should Keck or Maunakea Observatories in general have a presence at AAS. “Presence” could mean
 - splinter session
 - town hall
 - exhibit booth
- Possible Keck messages:
 - community access for time (via NASA)
 - 60% of Keck papers (1st or 2nd author) led by astronomers outside the main Keck institutions
 - availability of KOA

Remote observing policy update

- New remote observing policy [available](#)
- New site requirements, which do not include ISDN
- No more eavesdrop mode
- Zoom is the new videoconference software
- Remote observing contact is Josh Walawender
- Observing “from your kitchen” is prohibited for good reasons. Remote observing must be from an approved site.

FOBOS update – Part 1/2

- FOBOS would provide high-sensitivity (<25 mag) in the 310-1000 nm range with wide FOV (goal of 20 arcmin diameter) with 1800 fibers, addressing several themes: Dark Energy, Galaxy formation, Local Group Assembly. Suitable for target densities of $6/\text{arcmin}^2$. Possible future upgrade path to deployable IFUs, GLAO compatibility, etc.
- MSRI step-1 submitted to NSF on Feb/19 (\$2.5M) - Waiting for NSF status. Step-2 proposal due May/20.
- Since step-1 submission, the team has been working on an improved design, developing a detailed schedule and science work-packages. The budget for the work under the design proposal has increased by 30% over the step-1 pre-proposal.
- Based on discussions with WMKO, FOBOS would be fixed on the Keck-2 Nasmyth deck - It cannot go to Keck-1 because K1DM3 has limited FOV.
- The ADC (Atmospheric Dispersion Corrector) would be located at the Nasmyth port and connects to the Starbugs Fiber Positioners, providing flexible multiplexing.

FOBOS update – Part 2/2

- At the frontend of each fiber, the lenslet coupling optics alignment is a critical design, and represents a major development risk.
- Optical and spectrograph designs are now being optimized, and project risks have been identified (e.g., alignments, calibrations, schedule delays).
- FOBOS will employ Fuse-Silica-Etched (FSE) gratings that provide high efficiency (up to 80%). Full instrument throughput estimates range from 40 to 60%, where the difference between those two numbers depends heavily on the performance of gradient-coated CCDs currently under development.
- The team (e.g., PI, Project/Instrument scientists, Engineer) has experience on the MaNGA project to map nearby galaxies and SDSS, Apogee.
- Why FOBOS is less expensive than TMT Fiber-WFOS? savings on international partnerships (5-10% savings), and simpler build schedule (30% savings).

White Paper / Phase A Call Scheduled to be Issued

- For 2019 WMKO white paper call, total funding available will be \$125K
- For Phase A studies, \$250K is budgeted
- Recommended changes to the proposal call relative to the 2018 call:
 - Require reporting to WMKO one year after project funding is received, and presentation to SSC
- Issues to consider for the call:
 - Should the call highlight specific instrument needs or science capabilities that the community might otherwise not be thinking about?
 - LRIS is aging: should we be considering a new optical spectrograph, e.g. LRIS2? How to encourage instrument builders to build workhorse facility instruments that are not necessarily technically innovative or glamorous projects?
- Broader discussion of instrument suite planning that arose in the discussion:
 - Review of data on older instruments with respect to productivity and demand.
 - Need to consider KI/KII instrument balance and possible KI/KII instrument swaps.
 - Need to consider WMKO's ability to support a growing instrument suite.
 - Need to consider whether core capabilities should eventually be retired after new similar capabilities are online, even if the new instruments are not full replacements (e.g., HIRES -> KPF? DEIMOS -> FOBOS?).

WMKO Astro2020 APC white papers (day 2 discussion)

- SSC endorses WMKO ideas for Astro2020 activity / state of profession white papers:
 - Need for robust data services in the large-aperture O/IR Community
 - Need for instrumentation design / development funding on regular cadence
 - SSC also interested in the ground/space synergy idea, as well as shared Maunakea infrastructure in TMT era idea, but recommended actions must be worthwhile for Keck community
- SSC also discussed a new APC WP idea: Improving the workforce and facilities for large telescope instrumentation development
 - Lack of attractive long-term university positions for instrumentation scientists
 - Possible need for some central organization and facilities for very large (~\$50M+) instruments
 - We will need to draw on larger WMKO community and make actionable recommendations for an effective white paper