Keck SSC Meeting

Nov 9-10, 2016 Caltech

Judy Cohen and Jean Brodie

We welcome Jean Brodie (UCSC) to her first meeting as UC Co-Chair of the Keck SSC

Observatory Report (1)

- MOSFIRE accident
  - Internal & external reviews completed
  - Accident due to TCSU problem with rotator control, thereby likely inducing severe resonance in the instrument
  - Technical and management failures led to the incident.
  - TCSU will not be used until it is tested more thoroughly, reverting to original system for now.
  - 12/1: External review of Keck work culture and practices
- MOSFIRE has been opened & inspection underway
  - Collimator assembly has visible damage
- PSF-R (PSF reconstruction) facility system design review completed, on-sky science verification in November

Observatory Report (2)

- K1 Deployable Tertiary
  - Fabrication completed, I&T underway
  - Commissioning planned in July 2017
  - Shared risk likely in 2018A
- KCWI-B
  - Passed pre-ship review, to ship by early January
  - Commissioning in Spring 2017, shared risk likely in 2018A
  - KCWI-Red replan underway, work to start in 2017
- Keck Planetary Strategic Plan nearly complete
  - Immediate audience is NASA Planetary Division
- WMKO is actively engaged in Maunakea issues, outreach to local & state govt, and community groups.

Observatory Report (3)

- Observatory instrument commissioning schedule constrained by heavy workload
- NIRES installation in summer/fall 2017
- NIRSPEC upgrade delayed until late 2017
- New segment warping algorithm + PCS upgrade improves image quality by 15%.
- Primary mirror segment repair
  - Starts in November, ramping up to full in 2017 (27 segments)
  - Completion in late 2019
- New Support Astronomer, Observing assistant, internal project manager have been hired.
- New Instrument Program Manager & new Communication Director being recruited

MOSFIRE Images

- Accident occurred 2016 Sep 14 during TCS upgrade testing which resulted in violent oscillation for ~120 sec
- After accident MOSFIRE showed poor image quality which depended on orientation
- Most likely a collimator lens became dislodged
- Inspection and diagnosis is ongoing.

Summit Inspection Results

- MOSFIRE opened on 2016 Nov 7, showing abrasions on one collimator lens and loose material on another
- Ongoing inspections
  - Collimator barrel examined, no damage found
  - Inspect other optics, slit mechanism for damage

Management Actions

- Management fully committed to addressing the failure & underlying issues - 3 part investigation, 2 parts completed
  - 1. Detailed internal incident report: done Oct 3
  - 2. External incident review panel review: completed Oct 18
  - 3. External review of WMKO work culture & practices: planned Dec 1
  - WMKO Director will report on recommendations at February SSC
- Top level initial finding:
  - Testing was conducted remotely without sufficient safeguards.
  - Related incidents over the past 2 years
  - Collective responsibility of both WMKO management & the TCSU team
- Incorrect assumptions made by the TCSU team include:
  - TCSU's rotator servo control development was considered complete
  - Previous rotator subsystems had worked with existing DCS, and they assumed no further analysis needed for TCSU rotator testing T
- Immediate change is to revert to original DCS. TCSU will be reintroduced incrementally as modes are re-qualified

KCWI Status: KCWI-B

- Pre-ship review held and passed Oct 4-5.
- Essentially all requirements met:
  - Spectral resolution as predicted: R=20,000 at highest
  - Efficiency is close to or exceeds requirements for low and medium resolution; BH3 grating is particularly low. New (no charge) BH3 to be installed during commissioning.
  - Contrast and sky subtraction requirements met
- Conducting ~2 months more work before shipment:
  - Effort level is 2 FTE integrated over team
  - Exercise mechanisms to improve reliability
  - Replace structural beam in cart
  - Install new BH1 grating, calibrate all end-to-end efficiencies
  - Improve documentation, shipping readiness

KCWI (2)

- Current ship date is 28 December 2016 with special care necessitated due to thermal sensitivity of bonds
- KCWI-B DRP - preliminary testing by KCWI Science Advisory Group
- KCWI intends to develop exposure time calculator and data simulation tool
- KCWI-R development to start after KWCI-B shipment
  - Alan Uomoto (CIW) hired as 50% time project manager for KCWI-R
  - Detailed project plan is under development

Unattended Night-Time Operations at Summit

Planing for UNO is driven by the need for cost savings (CARA board mandate) and desire for increased efficiency and reliability

Financial savings anticipated ~$400k/year mostly from reduced labor costs

Science time net gain of ~4 nights/year through efficiency gains

New tools to support unattended operations: $1.4M (8.9 FTE)

Improvements to existing equipment: $2.5M (9.2 FTE)

UNO must be at least as efficient and safe as current operations Team is working to understand and mitigate risks. Closing K2 dome remotely may require rework of existing systems.

Need to improve instrument reliability and introduce remote monitoring, fault detection, control and recovery.

UNO already implemented by CFHT (2011) and Gemini (2015) – but Keck's classical model has additional concerns/requirements.

Managing the cultural change in the Keck observing community is critical requirement.

UNO reviewed on 10/21/2016.

Reliability improvements desirable regardless whether/when UNO is implemented

Start implementing and report back regularly to SSC (Additional reviews scheduled May 2017 , January 2018)

Data Reduction Pipelines Issues

- There is growing demand from observers to have state of the art, well written, fully supported DRPs for Keck instruments
- Problems with the current situation:
  - Numerous DRPs written by different groups in different languages with no coordination
  - Deficiencies in metadata
  - Pipelines written by astronomers often suffer from poor software design and poor engineering practices
  - Individual, un-coordinated efforts are not generally an efficient use of time and resources
  - Insufficient resources to fully support desired activities

Data Reduction Pipelines

- SSC recommends establishing a study group with the following responsibilities:
  - Develop a menu of options with costs
  - Establish software standards
  - Scientists should be in charge of algorithms
  - Engineers should be in charge of the coding
  - Study best practices from other observatories
  - Report at June SSC meeting
- Luca Rizzi should lead the group

MRI Proposals

Keck-AO Real-Time Controller upgrade (P. Wizinowich)

An update to the (10 year old) RTC will enable full science return from new laser and enable future AO upgrades

New proposal could be based on recent (unsuccessful) MSIP & LIEF proposals
though won't have laser tomography or tip/tilt

- connects well with interest by private foundations in supporting Keck AO

Policy Issues

- LRIS
  - Issue of trying to get LRIS slitmask information in the headers,i.e. useful in the archive.
  - May be possible to recover information from the past using the Lick slitmask database.

- K1DM
  - Issue of K1DM availability and non-ToO instrument switches, i.e. PIs wanting
    to propose for access to multiple instruments. Concerns of the SSC are:
    - Primarily, impact on support astronomers
    - To a lesser extent, unvetted science
  - Delay to future meeting for more complete discussion when more experience with use of K1DM for ToO programs

OSIRIS PIPELINE

Data pipeline changes associated with the new detector are largely complete

- But more persistent pipeline problems with extraction and calibration remain and much larger team is tackling these.
- Two “Hackathon’s” held at UCLA
  - 2016 May 4-6
  - 2016 Sept 7-9
- Primary issue is PSF elongation created by new grating, which was addressed in part when new detector installed
- New pipeline version will be released new week
- Work will continue on remaining issues
- SSC appreciates community effort toward resolving this problem

- Lessons Learned
  - Need for more commissioning time at the telescope after major upgrades to validate all modes

  Observatory should update the OSIRIS documentation to indicate which modes are preferred and potential problems that may arise using non-preferred modes.