

# SSC Meeting Notes

## 2022 March 8-9

Meeting held at WMKO

# Introduction and Review of Actions

- The SSC welcomes Jason Wang (Northwestern University)
- The next SSC meeting will be held via zoom on May 12-13
- Past Action Items:
  - KPF cadence committee requests to present to the SSC
  - SCALES imager requirements working group launch still TBD

# Observatory Report

- Science highlights
  - Red supergiant observed before/during/after supernova: UCB and NW leads, LRIS/DEIMOS.
  - Keck HIRES characterized ultra-short planets (UH/AMMH)
  - NIRSPEC rotation characterized and mapped flows of ionosphere via IR emission (NASA)
  - Protocluster characterized with MOSFIRE (Keck SA and team)
  - NIRSPEC characterization of mini-Neptune's atmospheric loss (CIT)
- Public talks: monthly public talks with large international participation and increased reach. Talks recorded and available on Youtube. Schedule for 2022 now being defined (recommended speakers welcome).
- COVID status
  - Switch to pajama mode during the Omicron surge
  - There were 50 cases during the last variants
  - HQ remains open. Non-site essential staff can work from home
  - Reducing restrictions until April 2022.

# Observatory Report

- **Science Strategic Plan:**
  - **Update:** Dec/2021 meeting in Pasadena, with >40 white-papers and a Feb/22/2022 SSC meeting to discuss white papers.
  - **Timeline:** organized by themes/recommendations to be further evaluated at this meeting and with the board this week (e.g., new instrumentation, partnerships). Finalization by May/2022 SSC meeting, and to present to the board on July/2022.
- **Partnership Strategic Plan will be discussed at upcoming board meeting.**
  - Should we bring in new partners?
  - How to fund robust instrumentation program.
- **Organizational Strategic Plan:**
  - Meeting on April 5-6, development of sense of ownership, long-term planning and staff-driven look of the general structure of the organization
- **Community Strategic Plan: enhance community relations and produce a white paper for inclusion into the plan.**
- **General deadline for the 5-year Strategic plan is March 2023, with specific intermediary deadlines during workshops and meetings in 2022.**

# Observatory Report

- 5-year operational plan: postpone to FY24 to incorporate Strategic Plan.
  - Maintain regular operations and include changes in the workforce environment.
  - Complete major projects underway and address major infrastructure needs.
  - Develop community engagement package.

# Major Projects Update

- K1 pier repair trial will be conducted Sep or Oct 2022. Pier risk is now medium.
- Unattended Night Operations (UNO) hardware is being ordered and installed. Expected to start trials in 2023 with close to full operations in 2024
- KCRM: Most subsystems complete, delivery Aug 22. Commissioning Dec - Feb and available for science in March 2023.
- KPF : All major components received or being shipped. Pre-ship review in April with shipping 3 weeks later, integration in Keck basement, May/June FIU commissioning, Sep-Jan spectrograph commissioning, available for science Feb 2023. Keck infrastructure is ready.
  - Using one spare detector that will lengthen readout times (only ~1-2% efficiency hit for targets needing only 1 exposure per visit)
- Laser frequency comb : Hardware assembled and functionality demonstrated. Expect delivery April 2022 and available for NIRSpec and KPIC this summer.
- (S)CALES PDR cost has increased due to extra scope, Keck-directed design work, and underestimates. Passed PDR, new integration facility done.

# Major Projects (2)

- DEIMOS CCD+FCS upgrade: Teledyne e2V CCD contract to be completed this month, and then project will complete 2.5 years later
- HISPEC may be rescoped to a 2 channel spectrograph (YJ + HK), different from last presentation to SSC. PDR estimated to be in November 2022.
  - SSC to review HISPEC science, scope, cost at May meeting.

# General Proposal and AO Updates

- AO updates:
  - HAKA procurement of (3000 actuator) deformable mirror.
  - ORCAS visible science camera demonstrator (ORKID) for spring install.
  - K2 real-time controller installed and interfaces being tested, WFS camera being tested.
  - KAPA progress on hardware: laser operational; RTC, WFS camera installed.
  - KAPA science verification now FY2024.
  - KPIC Phase 2 installation (mid-Feb 2023 start) with pyramid WFS throughput gains.



# DSI Report

- Real time ingestion (RTI) into KOA archive operational with KCWI.
  - Plan to have 4 instruments pushing Level 0 (raw) data through RTI by April. All instruments by end of year.
  - DEIMOS pipeline-processed data (quicklook and Level 1) will enter RTI next.
  - KPF/KCRM will have RTI with science availability.
- Typical KCWI availability at IPAC in ~10 sec (Level 0) to ~2 min (Level 1).
- Successful software design review of Database Driven Observing Infrastructure DSI component.
- DSI observing definition tool and night planning tool being prototyped, starting with KCWI. Observers will be able to start using these tools starting this summer if they want.

# Planning for Phase A proposal call

- 2022 Instrument development white paper call will be released after May 2022 SSC meeting. SSC will review draft language then.
- SSC discussed possibility of opening the call to include engaging Keck community to define requirements for new instruments in lieu of full concept studies

# 2022 Keck Science Meeting logistics

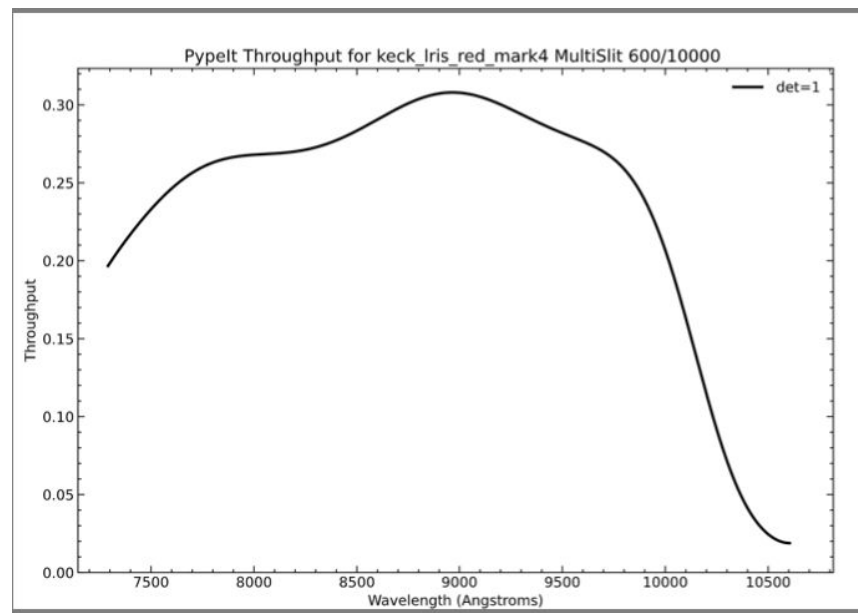
- SSC meeting will be September 15-16 at Caltech. It will be in a hybrid in-person / remote format.
- Future KSMs are also likely to be hybrid in order to allow broader participation.

# Instrument Reports: Overview

- New SAs hired: Michael Lundquist (DEIMOS), Rosalie McGurk (KCWI), Chien-Hsu Lee (TDA)
- New AO Operations scientist: Max Service

# LRIS: Percy Gomez

- Aging instrument; ongoing work required to maintain & upgrade
- Repairs done: blue dewar, grating mechanism, guider electronics
- Ongoing work: software upgrades, grism mechanism
  - New control GUI developed, including a new focus GUI
  - Polarimeter parts under order, should be repaired by June
  - R150 grating replacement by mid-2022
- Near-future plans
  - Servicing mission planned in summer 2023: only one dark period downtime, planning underway now
  - A replacement for 'autoslit' software
  - Replace Solaris-based GUIs with linux-based

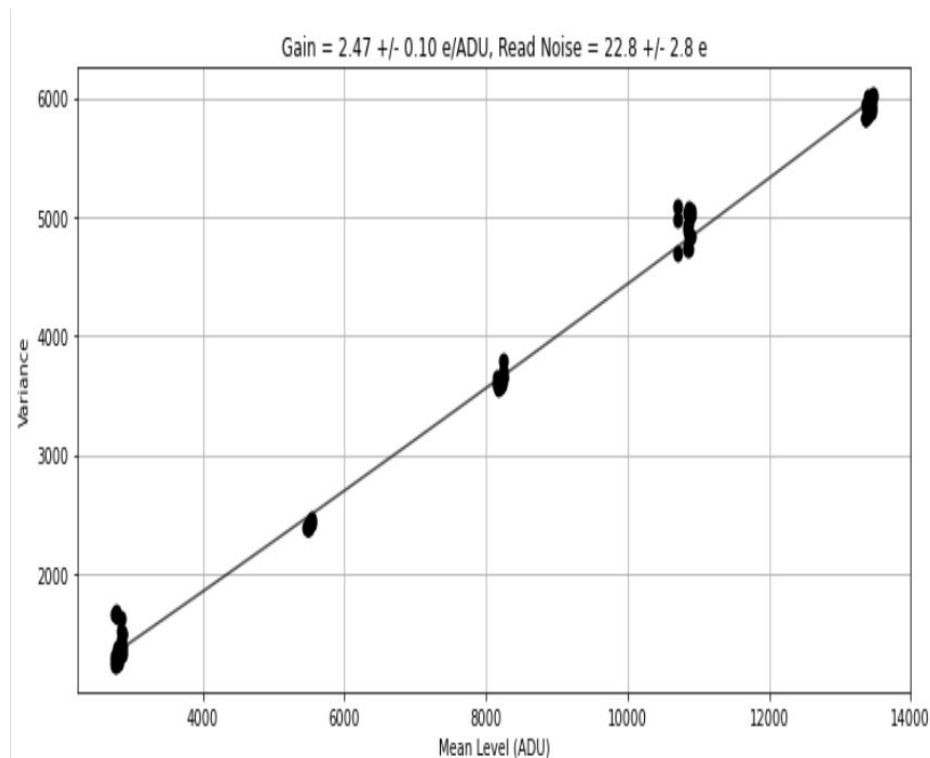


# HIRES: Greg Doppmann

- Recent repairs/replacements
  - Exposure Meter controller
  - CCD shutter
  - Dessicant for air supply
- Occasional noise artifacts seen in bias frames: on-going issue
- New HIRES mechanism GUI replaced XHIRES GUI: better for use with VNC
- No servicing mission is planned.

# MOSFIRE: Josh Walawender

- Small improvements in past year with guider offsets, alignment process & FCS cold-weather behavior.
- Planning server upgrade from Solaris to Linux later this year
- Pypelt support for MOSFIRE is active now, including re-measuring gain & read noise (consistent with webpage values)



# OSIRIS: Sherry Yeh

- Servicing mission in November 2020: replaced lenslet mask motor
- Migrated data reduction pipeline to new Linux server: much faster
  - Online DRP can reduce data in <5 seconds
- Several UCLA & UCB-driven tasks underway
  - Wavelength calibration error study
  - New extraction method to mitigate incorrect flux assignment
  - Imager data reduction pipeline: now available on Github
  - Imager distortion correction
  - Updated user's manual
- Working group meets every ~2 weeks
- New RTC should help TRICK operational efficiency/reliability



# OSIRIS: Sherry Yeh

	<b>NIRC2</b>	<b>OSIRIS imager</b>
Detector	1Kx1K Aladdin-3 InSb	2Kx2K Teledyne H2RG HgCdTe
Wavelength ( $\mu\text{m}$ )	0.9 – 5.3	0.9 – 2.5
Pixel scale (mas)	10, 20 and 40	10
FOV ( $\text{arcsec}^2$ )	10x10, 20x20, 40x40	20x20
Sub-windowing	Yes	No
Texp min (full frame)	0.18s	1.5s
RON per CDS (e-)	60	23
Gain (e-/DN)	4	2.2
1% linearity (DN)	10,000 (40,000 e-)	20,000 (44,000 e-)
Zero point (J, H, Kp)	26.8, 26.9, 26.3	26.8, 27.4, 26.6
AO capabilities	PyWFS	TRICK

# DEIMOS: Michael Lundquist

- CCD5 remains noisier than normal
- Ion pumps have been failing occasionally - have been replaced & controllers upgraded.
- Ongoing development of new slitmask design tool.
- Ongoing data reduction pipeline development by Pypelt team, including a quicklook mode.
- Rotator servicing mission planned for May/June
  - Large undertaking involving partially lifting the instrument with a crane in order to access the rollers and bearings, involving a lot of safety coordination.
- Detector upgrade: submitted NSF MRI proposal, led by Evan Kirby
  - Planning for Teledyne detectors (procurement already underway with WMKO funding)
  - New dewar with hexapod mount for improved FCS corrections
  - If funded, would be completed in late 2024

# ESI: Jim Lyke

- Risk matrix entry with top risk is guider failure and an antiquated detector system
- The guider is to be replaced with a spare in FY22/23, awaiting mechanical design
- Detector high-temperature issue, not yet resolved, yet no change dark/biases, so probably an issue with the sensor contact.

# KCWI: Rosalie McGurk

- Updated pipeline from IDL version to Python version in 2021
- Automated real-time DRP has been tested by observers since Aug 2021
- KOA now offers real-time raw & reduced data
  
- Monitoring minor leak in the LN dewar, ion pump replacement has helped
  - UCSC seeking bids for a new cryostat
  
- KCRM installation upcoming, arriving for integration in August. KCWI will be off the telescope starting in June.

# NIRSPEC: Greg Doppmann

- Currently has 3 optical feeds: seeing-limited (NIRSPEC), AO free-space (NIRSPA0), AO fiber-fed (FIU/KPIC)
- Issues resolved: poor performance of image rotator, intermittent failure of mechanical control, new CCR cold heads
- Issues being addressed: problematic H2RG recovery (installation pending), elevated thermal background due to light leak (analysis underway).
- Recent open dewar (Feb 8/9): installed optimized AO pupil, new K-band filter, re-installed 0.72x24 slit, attempt to mitigate thermal leak
- New calibration database (arc lamps and stellar templates) at high-resolution (~42,000), with associated online GUI for easy access

# NIRES: Percy Gomez

- Slit-viewing camera guiding is now operational
- Slit vs. guider flexure measured (max < 1"); correction implementation is in-progress.
- Significant risks are optical guide shutter and ARC boards.
  - Guider to be replaced in 2022
- Software improvements ongoing to improve observing efficiency and minimize possible user errors.
- Status of previous white paper effort (UCSB) TBD.

# NIRC2: Carlos Alvarez

- Moderate risks are with instrument host (old Solaris machine) and detector transputers; additional risks with other detector electronics.
- Ongoing issues:
  - Detector server crashes occur almost every night, but little lost time,
  - Host computer spontaneously reboots (once every few months),
  - Low efficiency of readout (thermal infrared), and
  - Operational (largely software) issues with the vector vortex coronagraph (VVC) in combination with PyWFS.
- Significant fluctuations in detector noise (ranging from e.g.  $\sim 50 e^-$  to  $>80 e^-$  in CDS at different epochs, sometimes isolated to noisy quadrant, but can affect detector as a whole).
- Improvements in the past year include upgrade of RAM and migration of most operations to Linux host.
- Future improvements include:
  - Improvements to the VVC software
  - Upgrade of detector electronics to Archon (with  $>10x$  faster readout), completed 2023
  - Complete migration to linux.

# Time Domain Astronomy: Chien-Hsiu Lee

- Presented statistics on ToO triggers in 2021 A and B semesters. Majority of triggers are from UC. Spikes at the end of each semester.
  - Discussion: PIs exhibiting use-it-or-lose-it behavior suggests potential misuse of intention of ToO program, by triggering on non-high-priority events.
- Longer-term statistics from 19A-21B show dip in 2020, possibly due to pandemic-related restrictions on instrument swaps.
- Presented statistics on # of occurrences for twilight cadence program. Majority on K2, likely due to AO. Spike in 19B.



# AO: Max Service and Jim Lyke

- Major risk is the suite of ongoing upgrades. Additional risks due to inconsistency in calibrations. Several others including K1 ACAM failure, DM electronics failure, and other less-impactful risks.
- Updates since last year:
  - Hiring of AO Ops. Scientist Max Service
  - Improvements in room cooling, OBS power supplies, K2 ACAM replacement, rollout of linux kNanoservers
- Precision Calibration Unit (PI: J. Lu of UCB) acts as replacement of Source Fiber Positioner stage. New unit has SFP functions as well as pinhole mask and KPF pickoff. Mitigating PCU collision with encoder cover.
- Installation of KPF in K1AO ongoing, including fiber routing.
- K2AO upgrades of KPIC/PyWFS, including new roof prisms with improved AR coating (30% throughput increase). New Fiber Extraction Unit being added to NIRSPA0 plate for improved injection of KPIC light into NIRSPEC (eliminates fiber handling).
- Ongoing work: Re-forming AO Working Group (AOWG), improving calibration of OSIRIS (focus changes and cal quality assessment), LBWFS study, K2 TT power supply current draw, exploring additional room cooling, and additional training in use of PyWFS.
- Question to investigate via AOWG: what does the community need for AO telemetry? Database access, possible decimation of data. Order 1 TB/night, with much more for LTAO.
- Reviewed usage of Keck AO. K2 PyWFS mode is getting popular, points to need for making it facility-class.

# Metrics: Carolyn Jordan

- Presented several metrics for past 16 months, split by instrument.
- Most significant impact was from poor weather. COVID shutdown was 7 nights on each telescope.
- On average instruments lose several percent of time. Fault statistics affected by change in reporting; previously recorded only if there was a science impact, where now recording all faults (including daytime).
- Future of metrics program:
  - Tracking faults which require significant effort on the part of observatory staff to address.
  - Understanding where inefficiencies occur. Leverage DSI project to update how metrics are captured, including more granularity in readout times, inst. configuration, overheads in switching programs/instruments, idle time
  - Produce data to inform observing model
- Instrument usage on K1 is fairly level over past 5 years.
- Instrument usage on K2 is more variable: increases in ESI and NIRC2-PyWFS, with decreases in DEIMOS, NIRC2-LGS/NGS, NIRSPEC/NIRSPA0, and NIRES. [KPIC may be captured in NIRSPA0-LGS, even when using PyWFS, TBC]

# Remote Observing: Josh Walawender

- Many changes since Nov. 2020. Redefined software (v2.0). Observers now manage SSH key. Improved security by tying access to telescope schedule. Remote observing request now handles all nights of observing and links to schedule/VSQ/VNC. Vastly reduced effort to run remote observing relative to pre-Nov 2020.
- Changes in progress:
  - New videoconference hardware (resumed after pandemic pause on purchasing)
  - Network security improvements. Will monitor how these impact remote observing.
- Significant risks include network interruption when solo observer, security incidents, and Keck IT changes. Other risks include network interruption at observatory, hardware failure.
- Examined time lost and efficiency due to home observing. Total lost time from 2020 Jan to 2021 Nov is 104 minutes due to remote observing. Split equally between Zoom and remote observing software/VNC.
- Efficiency challenges: videocon more challenging with more sites (increased conversational crosstalk), leads to occasional communication failure with OA; non-std. or low-quality videocon equipment; limited screen real estate can lead to struggles keeping track of all GUIs, with occasional interference.
- Benefits: more observers overall, increasing from ~6 to ~8 per night, potentially improving access to science and training experiences; reduced carbon impact.

# Remote Observing: Josh Walawender

