Issue 14

Winter 2013

Contents

Director's Introduction

Taft Armandroff, Director, WMKO

It is a pleasure to welcome you to the first issue of the Keck Observers' Newsletter for 2013. This Newsletter contains a number of important updates on Keck Observatory's observing capabilities, including information about Keck's newest instrument, MOSFIRE, and its first semester of scientific observations. Also featured are an article on a new, more efficient grating for OSIRIS that makes significant improvements to this instrument's sensitivity and news on the restoration of NIRSPEC's infrared slit-viewing capability.

Work is proceeding on a number of other projects important to Keck observers. We continue to increase the power of the Observatory's adaptive optics systems. For Keck II adaptive optics, our project to improve system performance by implementing center launch of the laser beam (as opposed to the current side launch) passed its Detailed Design Review in January 2013. Keck Observatory is also working to improve telescope pointing accuracy and to address obsolescence issues by performing a telescope control system upgrade (TCSU) on both our telescopes. The TCSU project passed its Detailed Design Review in October 2012.

In March 2013, Keck Observatory will celebrate 20 years of cutting-edge science and innovation since the first scientific observations were obtained from the Keck I Telescope. The centerpiece of several commemorative events being planned will be a very special variation of the Keck Science Meeting. The two-day conference will feature a program of invited talks that documents Keck's ground-breaking discoveries and maps out a vibrant future for the Observatory. The Keck Observatory 20th Anniversary Science Meeting will take place March 14 and 15 at the Fairmont Orchid Resort on the Kohala Coast of the Big Island of Hawaii.

The Organizing Committee for the Keck Observatory 20th Anniversary Science Meeting consists of Charles Beichman (NASA ExoPlanet Science Institute), Judy Cohen (Caltech), Sandra Faber (University of California Observatories, ex officio), Andrea Ghez (UCLA), Debbie Goodwin (Keck Observatory), John Johnson (Caltech), Guenther Hasinger (University of Hawaii, Institute for Astronomy), David Koo (University of California Observatories), Shri Kulkarni (Caltech, ex officio), and myself. The audience of the meeting will include, as well as our professional astronomy research community, other key stakeholders in the Observatory, such as prominent university officials, representatives of the federal funding agencies and private foundations, major donors, and other essential constituencies. All of us at Keck Observatory look forward to commemorating 20 years of science and to sharing our community's common vision for a scientifically rich future.

In closing, I would like to recognize a prominent member of the Keck Observatory community who was honored recently. Sandra Faber, a University Professor of astronomy and astrophysics at the University of California, Santa Cruz was selected by President Obama to receive the National Medal of Science. Prof. Faber is a member of Keck Observatory's Board of Directors, served as Principal Investigator for Keck II's powerful DEIMOS instrument, and is a frequent and prolific Keck observer. Dr. Faber also serves as the Interim Director of the University of California Observatories. On behalf of all of the team at Keck Observatory, congratulations to Professor Faber. ✶

Operations Update

Robert W. Goodrich, Observing Support Manager, WMKO

There have been a few changes in night-time operations over the past six months. Hien Tran has taken on the role of HIRES Instrument Master while Scott Dahm is temporarily deployed to Afghanistan as a member of the Naval Reserve. Greg Doppmann is now the HIRES secondary master. We look forward to Scott's return in November. You might have experienced the pleasure of having your Observing Assistant (OA) working from Remote Ops with you during a recent observing run. This has happened in the past, but we are trying this out on a more regular basis, with roughly 1/4 of the OA shifts at HQ.

Randy Campbell has been working with U. S. Space Command and the Laser Clearinghouse to reduce the impact of so-called "blanket closures," when we are restricted from propagating the laser at all for an extended period of time. Although much of the decision-making process is classified for national security reasons, it seems that recent blanket closures have been significantly shorter, so we believe we have had some success in minimizing their impact on LGS-AO operations.

Many of you have already heard that the Keck Observatory Archive (KOA) is working to include data from all of the remaining WMKO instruments—LRIS, MOSFIRE, DEIMOS, ESI, OSIRIS, NIRC, and LWS—at first for PIs only and after a year (and subject to a proprietary period) to the public. In order to get all available Keck data online quickly, KOA is restricting the keywords it catalogs, meaning that some rarely used search options (specifically, searches on signal-to-noise and wavelength) will not be available for these instruments. Also, there will be only a rudimentary association of calibration files to each science file. (HIRES, NIRSPEC, and NIRC2 are already fully archived, and have more sophisticated calibration association algorithms.) Part of the development process includes deploying the tools that prepare and ingest new observations, so that your Keck data can be ready for you before your flight back to the mainland touches down. Currently LRIS and MOSFIRE data have been ingested and released to PIs (including all legacy data).

We have opened up Keck Observatory's Twitter account to allow observers to "tweet" during their observing runs. Please feel free to tweet about your science, the excitement of observing, or any other relevant topics. Observers using this capability have had some interesting dialogs with the public, and have triggered an upswing in public interest in the Observatory. We appreciate you using this account when you are observing either in Waimea or remotely. Your Support Astronomer will have more information if you are interested. ✶

MOSFIRE Stakes "MVP" Claim During Standout Rookie Campaign

Marc Kassis, Support Astronomer, WMKO

In its rookie semester, the Multi-Object Spectrograph for Infrared Exploration (MOSFIRE) efficiently scored high sensitivity *YJHK* spectra of stellar, high-redshift extragalactic, and planetary objects. First-time observers stepping up to the plate are pleasantly surprised when viewing science spectra that are routinely reaching sensitivity levels reported during commissioning (Summer 2012 newsletter, on-line documentation). MOSFIRE is the most sensitive IR imager at Keck and observers are making MOSFIRE the instrument of choice for low-resolution spectroscopy in the near infrared.

During the 2012B semester, Keck staff and observers alike have expanded their MOSFIRE knowledge, resulting in additions and improvements to the on-line documentation, observing software, and scripts. Observers are invited to review the evolving on-line documentation before each run. The site now

includes references to planning tools such as exposure time calculators and mask design software, as well as providing exposure recipes and fine-tuned checklists for startup and observing sequences.

Additions to the MOSFIRE GUIs include several new "Dark" filter options that improve efficiencies with mask alignments. Your support astronomers have modified the automated afternoon calibration script with more error checking and options for improved robustness. For observers interested in orchestrating their *YJHK* observing sequences, the recently deployed *YJHK* Orchestrating GUI can be used to automatically execute the desired observations.

A handful of observing programs are pushing MOSFIRE's sensitivity to new limits by observing with extra wide slits that reduce slit losses. By opening the slits wider than 10″, observers detected "fringing" in some night sky lines that manifests itself as ringing in the columns with signal levels varying by an amplitude of more than 50 ADUs (see example data). Fortunately, the fringing is suppressed by nod-pair subtraction, and observers who employ wide slits are encouraged to nod frequently to suppress the fringes. Observers employing typical slits width of 0.7″ will likely not see evidence of fringing in the night sky lines.

MOSFIRE's success has not been without issues and two common problems frustrate observers during the night: global server blocks and CSU fatal errors. In semester 2012B, MOSFIRE lost over 3 hours of sky time to global server blockages that cause the operational GUIs to lock up. Keck and UCLA staff found that software sometimes has trouble connecting to and disconnecting from the global server, causing the server message queue to fill up until it freezes the clients. Although we have yet to solve this problem, recently released software warns observers when the global server is blocked, and recovery scripts have reduced the time lost on sky. We continue to work on these to permanently resolve this issue.

CSU fatal errors are the primary source of lost time at night (accounting for nearly 12 hours) and are a constant source of frustration while acquiring afternoon mask calibrations. Because CSU bars positions are lost when the system faults, the CSU must be completely initialized following a fatal error. A full initialization can take 1 to 1.5 hours, but recent recovery advances have reduced this time to 30 min. In December, we released CSU recovery software that your support astronomer can run. The software acquires an image of the bars, measures their positions, and forces the software to use those positions. The measured positions are accurate enough to open the mask, but not yet accurate enough to allow the system to be used for spectroscopy. The script then opens the mask and initializes the CSU, completing in under 20 minutes.

In the upcoming semester we will be attacking the CSU problems from two angles. First, we will improve our recovery software to more accurately measure the bar positions, allowing observers to continue acquiring data without having to initialize the CSU. Second, we are working with the MOSFIRE development team and staff from Swiss manufacturer CSEM to better understand why the CSU faults. CSEM staff visited Keck during the first two weeks of February to test spare electronics and diagnose CSU faults. Our hope is that in the 2013A semester, we will eliminate the CSU fatal errors.

The MOSFIRE team wrote and released a MOSFIRE Data Reduction Pipeline (DRP) to help new observers quickly turn their raw data into calibrated spectra. With more and more of our observing community using MOSFIRE, feedback on the DRP increased. The current version of the pipeline is designed to use a sequence of spectra and calibrations to flat-field, spatially rectify, and wavelength-calibrate the science files, but does not currently perform flux calibration, telluric correction, or spectral extraction. A version of the pipeline running on a Linux machine will soon be available at Keck to observers who want a quick look at their data at night.

Useful DRP links and FAQs are collected on MOSFIRE's DRP web doc. This does not replace the code repository at https://code.google.com/p/mosfire/ but hopefully helps with installation and usage. Installation instructions are provided at the code base repository and Keck staff have fine-tuned the instructions for MacOS users (http://www2.keck.hawaii.edu/inst/mosfire/drp_install.html). Questions regarding code operation, bug fixes and enhancements should be submitted via the MOSFIRE DRP code forum; response times to forum submissions are roughly 2–3 weeks.

Are you a MOSFIRE mask designing procrastinator? Hopefully not, because time spent designing masks on the afternoon of your run reduces valuable calibration time with MOSFIRE. Please keep in mind that mask changes can take up to five minutes, filter changes require a minute, grating changes two, and the pupil rotator two to three. If you require arc lamps (typically *K* band only), you must wait three minutes for the hatch to open and close. With these overheads, a flat and arc sequence for a single mask in *JHK* bands can require 25 minutes to complete and means you may be limited to calibrating 4 to 6 masks before sunset. If you have mask design questions or need assistance, please ask in advance so that these issues can be resolved before the day of your run. We look forward to seeing what science MOSFIRE observers will produce in the coming months, and to making your observing runs as efficient and productive as possible. ✶

SCAM Revival Restores NIRSPEC's Infrared Slit Viewing Capability

Greg Doppmann, Support Astronomer, WMKO

Last spring, the infrared detector for NIRSPEC's slit viewing camera (SCAM) developed a serious electronic problem that adversely affected its ability to image the slit field of view. The intermittent problem manifested itself as noisy readout showing severe horizontal banding and peculiar artifacts, including a diagonal flaring structure that seemed to emanate from hot or unresponsive pixels (Figure 1).

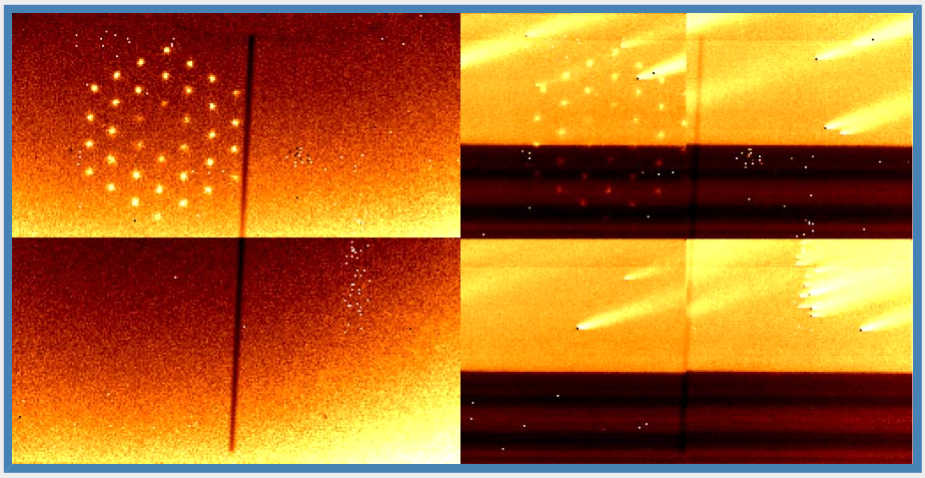

Figure 1. Normal (left) and abnormal (right) SCAM images taken during a MIRA focus sequence. *Click image to enlarge.*

The occurrence of these abnormal readouts was initially intermittent, but became more frequent in the passing weeks and began to adversely affect observing efficiency. Finding no problems with the electronics external to the dewar, we decided that the NIRSPEC cryogenic dewar needed to be warmed and opened so that the internal wiring to SCAM could be inspected. In July 2012, we removed NIRSPEC from service, and performed a thorough inspection of the inside of the dewar. While we did not find any breaks in any of the wiring leading to SCAM, we did locate several places where wires previously taped to the cold bench were now free and touching the inside of the dewar wall. Keck's technical staff retaped the wires to the cold bench, away from the dewar wall. Several tight bundles of wires connecting to the SCAM detector mount were also "fanned out" to minimize any possible electronic interference or pickup.

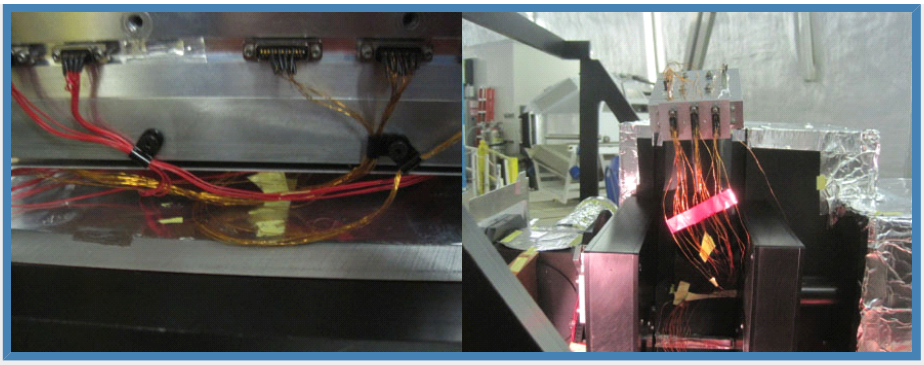

Figure 2. Dewar wires needing to be retaped to the inside of the dewar (left), and wire bundles going to the SCAM detector mount were "fanned out" with dewar tape (right).

Finally, one of NIRSPEC's slits (0.576″ x 24″) was removed from the slit wheel to enable a direct imaging mode on the science detector with the grating's zeroth order, in case a future SCAM problem prompts us to use that option. Our staff completed the service work in just one day, after which we closed NIRSPEC back up and ran the pump for a week. We then cooled NIRSPEC down to its operating temperature and returned it to service in early August. We are pleased to report that there has been no re-occurrence of the SCAM detector readout problem since this service last summer. ✶

OSIRIS Grating Upgrade Doubles Instrument Throughput

Jim Lyke, Support Astronomer, WMKO

OSIRIS, the AO-fed, integral-field spectrograph on Keck I, received a new, more efficient grating on December 8, 2012. The upgrade project was funded in part by the Dunlap Institute for Astronomy and Astrophysics at the University of Toronto. The grating was produced by Bach Research. Initial on-sky tests indicate that the new grating is more efficient in *z*, *J*, and *H* bands by a factor of 1.5 and in the *K* band by a factor of 2.5. This outstanding performance improvement will allow observers to chase ever-fainter objects—a favorite pastime here at Keck. The new grating requires several changes to the OSIRIS data reduction pipeline, including new rectification matrices which we hope to make available in the near future. Please watch the OSIRIS news page for further information. These new matrices, and a new version of the data reduction pipeline are forthcoming. ✶

New Booking Process for VSQ Rooms Streamlines Reservations

Peggi Kamisato, Librarian/Archivist, WMKO

Requesting a VSQ room is now similar to booking a commercial hotel room online. The new VSQ booking engine is linked to the Waimea Observing Confirmation form (Figure 3).The last question on that form is a radio button choice. If you select "Observing and I need VSQ accommodations" and then the "Confirm Request" button will take you to the new VSQ booking engine (Figure 4).

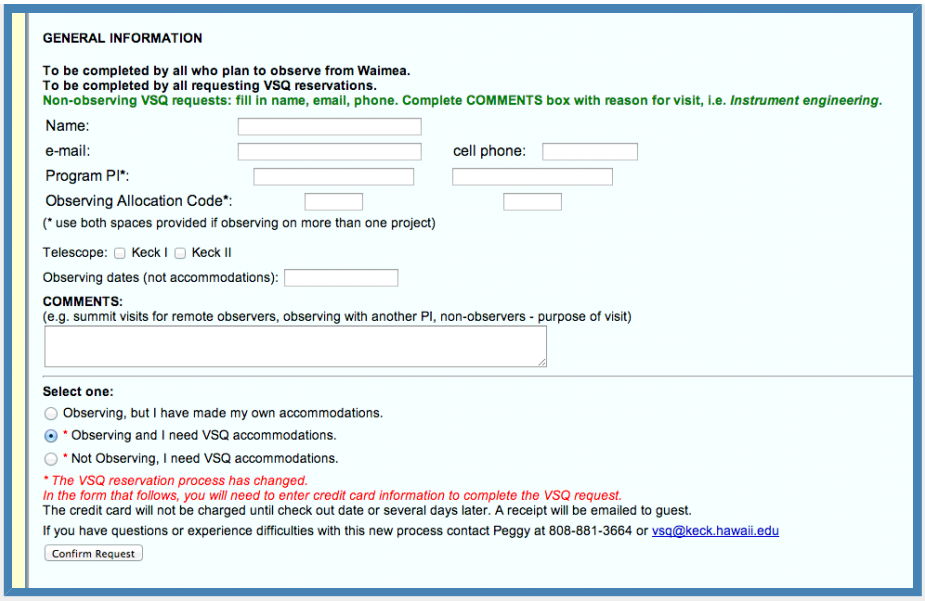

Figure 3. Waimea Observing Confirmation web page.

Figure 4. VSQ booking website.

At the VSQ booking site, select your desired check-in and check-out dates. The following page will ask you to review dates and agree to our WMKO VSQ polices. Next you will be prompted to enter contact and credit card information. After submitting your request, you should receive an automated email confirmation. Please check this email to ensure that your dates are correct. You will receive a final confirmation of your reservation in 2–3 business days. Again, please verify that your reservation details are correct. If you do not receive an email confirmation in 4–5 business days, please contact us at vsq@keck.hawaii.edu.

Your credit card will be charged on the day of, or a couple days after, your departure. We will email your invoice to the address you entered on the contact and billing page.

Our new Administrative Assistant Peggy Rapoza (808-881-3664) is now the primary contact for VSQ reservations. Please contact her to request changes to your VSQ reservations or if you have general questions about VSQ. If you are here at Keck headquarters you can find Peggy in the front lobby.

Use vsq@keck.hawaii.edu to ensure that your VSQ changes or questions are received by Peggy or her backup support. ✶

Wal Sargent — A Remembrance

Robert W. Goodrich, Observing Support Manager, WMKO

As many of you know, Wal Sargent, the Ira S. Bowen Professor of Astronomy (Emeritus) at Caltech and a long-time Keck supporter and observer, passed away on October 29, 2012. Wal observed throughout the lifetime of Keck, but my relationship with him goes back even further, to my first astronomy class as an undergraduate at Caltech. Wal taught that class, and his style and wit made that (and other classes that Wal taught) a real joy. While describing a night-time observing exercise for the class that used the telescope on the roof of the Robinson astronomy building in Pasadena (housing at the time a 1/10 scale model of the 200-inch Palomar telescope), he mentioned that some of the objects he was describing (such as M31, the Andromeda Galaxy, and M13, the Great Hercules Cluster) could be seen with the naked eye, but admitted that he had, in fact, never seen them himself. I found this most amusing.

My first undergraduate research paper in astronomy was on Seyfert galaxies, and referenced Wal's work heavily, as did subsequent research. Whenever I remember Wal from those days, the term that springs to mind is "pundit." After you had sufficiently proven yourself in the world of astronomy, he would bestow this title on you, entering a room with "Good morning, pundits," for example.

At Keck, Wal was an early HIRES user and served as both a member and chair of the Science Steering Committee (SSC) in our early history. A number of people have commented to me that he would often stop and talk to them while he was in Waimea, showing an interest in their lives that many of us never find the time to inquire about. Wal was on the telescope schedule 238 nights since 1992 at WMKO, using all of the optical instruments and NIRSPEC, often as one of the first observers after commissioning. In fact, the layout of the Keck I remote observing room was "designed" by Wal. (No, the noisy electronics equipment housed in the corner was not Wal's idea.) Many of Wal's students have also observed at WMKO, and have gone on to play important roles in astronomy.

You can read about Wal's many important scientific contributions elsewhere, but here I want to acknowledge his great human contributions to the Observatory. We will miss him in our hallways, at our conferences, and in our hearts. ✶

Back Issues

Please see the Keck Observers' Newsletter Archive.