Science Steering Committee Meeting

Staff Astronomer and Adaptive Optics Presentations

Virtual Meeting via Zoom
November 11, 2020
Group 3
NIRSPEC, MOSFIRE, NIRES, Remote Observing
NIRSPEC

G. Doppmann

- High Resolution (R ~25,000) Cross Dispersed Near-IR Echelle Spectrometer on Keck II
- Y, J, H, K, L, & M bands
- Low & High Resolution Modes
- AO-fed mode (direct or via Fiber Injection)
- Upgraded in 2018:
  - New Detectors (SPEC & SCAM)
  - Updated Electronics
  - Increased Mechanical & Thermal stability
## NIRSPEC Risk Matrix

<table>
<thead>
<tr>
<th>Likelihood of Occurrence</th>
<th>Very Likely &gt;70% within year</th>
<th>Probable &gt;35% within year</th>
<th>Possible &gt;5% within year</th>
<th>Unlikely &lt;5% within year</th>
<th>Very unlikely &lt;1% within year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low pressure dewar sensor failure</td>
<td>Water Ice buildup inside dewar</td>
<td>CCR Cold Head Failure</td>
<td>Echelle Grating Mechanism failure</td>
<td>Cross Disperser mechanism failure</td>
</tr>
</tbody>
</table>

|-------------------------|-------------------------------------------------|-------------------------------|----------------------------------|-----------------------------------|-------------------------------------|

*November 11, 2020*  
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Work Completed

Instrument Warmed and Opened (Feb. 2020):

- Rotator Worm gear replaced (20 years of wear)
- New Pupil Stop added to Filter Wheel (NIRSPEC/FIU project)
- Spare CaF$_2$ Dewar Window replaced older one (hygroscopic optic)
- SPEC detector housing made more light-tight to reduce elevated thermal counts
- Water Removed with Annual warm and pump service (annual service)

Frequency of Bad or Missed Telescope Nods Reduced:
- Mitigated in software using isolated telescope offset commands
Additional Work Completed (Aug. 2020)

Issue:
• Occasional Failure of Galil Motion Controller (drives internal stages)
• Traced to high current draw cases, i.e. Rotator and/or Echelle grating
• Mitigated with power cycling, and re-initialization of all mechanisms
• Calibration frames no longer valid

Resolution:
• Replaced Wiring with Thicker Gauge
• Galil Power supply re-wired through terminal block
• Better contact to mechanism control with new connector
  ◆ Increased Reliability of Internal Mechanism Control
Upcoming Service Work: Feb. 2021

- Replace both CCR cold heads (350 and 1050 stages)
- Replace failed inverted magnetron pressure sensor (for monitoring operational dewar pressure)
- Extended Warm pumping (to remove accumulated water inside dewar – annual)

On-going Work

- Effort to reduce Readout Overheads with coadds for SPEC and SCAM (Current KVSP project)
- SCAM guiding capability: Not presently reliable with current state of detector
MOSFIRE

- Medium resolution IR spectrograph and imager
- MOS or long slit spectroscopy
- 6.1’ FoV
- Covers one band (Y, J, H, K) in a single observation
Cryogenics

- Cryo system: 3 CCRs
- Does not require summit access (if power stays up)
- Has survived two long interruptions of summit access in last 18 months (TMT protests and COVID shutdown)
Updates Since Last Year

- Guider repair complete. Replaced CCD in guider to restore full FoV.

- Spares situation has improved:
  - Spare Macu board modified by summit staff. Tested and verified.
  - Spare FCS controller acquired. Needs to be have zero points set (daytime operation).
# MOSFIRE Risk Matrix

## Likelihood of Occurrence

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<th>Very unlikely &lt;1% within year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>• FCS Controller</td>
<td>• CCR Failure</td>
<td>• Catastrophic CSU Failure</td>
</tr>
<tr>
<td></td>
<td>• CSU Fatal Error</td>
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</tbody>
</table>

## Risk Severity, Impact

|-----------------------|-----------------------------------------------|-------------------------------|----------------------------------|-----------------------------------|---------------------------------|

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NIRES Status

Figure 1. Full slit-scan NIRES spectra (in log) with significant emission lines marked at their expected location based on the target object. Targets are named for visibility/quality. Targets of hightelluric absorption are shaded grey, and the spectra has been smoothed with a two-pixel Gaussian kernel for clarity. Figure continues on the next page. Objects marked with a red triangle may have negligible absolute flux calibration due to a lack of prior photometry or reference objects in the NIRES slit-lineup.
## Work Done

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slit-viewing-camera guiding</td>
<td>This mode was successfully tested. We are in the process of making this mode operational</td>
<td>ongoing</td>
</tr>
<tr>
<td>Slit-guider flexure</td>
<td>The flexure has been measured (maximum delta &lt; 1”). We are implementing a correction for this.</td>
<td>ongoing</td>
</tr>
<tr>
<td>Pipeline</td>
<td>Ongoing work with Pypeit team to have a real time quick sky-subtracted display</td>
<td>ongoing</td>
</tr>
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### NIRES

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<th>Very unlikely &lt;1% within year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Optical guider shutter</td>
<td></td>
<td></td>
<td>Piezo actuator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ARC boards (22, 46, 64)</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>Instrument servers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Negligible: Little to no impact on Observation</td>
<td>Minor: Observation Compromised</td>
<td>Moderate: Observation Interrupted</td>
<td>Serious: Instrument Down one Night</td>
<td>Major: Instrument Down Indefinitely</td>
</tr>
</tbody>
</table>

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## Issues

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<tr>
<td>Flexure Compensation System</td>
<td>Control the FCS (slit – science detector) mechanism.</td>
<td>ongoing</td>
</tr>
<tr>
<td>Optical guider</td>
<td>The shutter is beyond its lifetime</td>
<td>To be replaced</td>
</tr>
</tbody>
</table>

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Remote Observing
Changes Since Last Year

- Pre-COVID
  - New software for launching VNCs is now complete
  - Testing of new videoconference hardware for Keck (summit and HQ remote ops rooms) stalled due to COVID
Updates Post-COVID

• At home (aka Pajama Mode) observing implemented in response to COVID.

• Uses new Remote Observing software which underwent rapid development.

• Uses new database for managing SSH keys. Over 400 keys in our system

• Implemented a new ticketing system for users to get help with Remote Observing (250+ tickets and counting)

• Use of ISDN lines has been dropped.
In Progress and Future Plans

• For planning purposes, I am assuming some form of at home observing will exist for the 21A semester and probably after.

• Security Changes:
  • Zoom has forced us to implement a Zoom password: 1993
  • We will be doing more frequent firewall password changes
  • We have a new method for distributing secure info to observers.
  • Will be incorporating it in v2.0 of Remote Observing software.
  • Observers will be able to upload their own SSH key
  • SSH keys will be enabled/disabled based on the telescope schedule, so make sure you are listed as an observer!

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## Remote Observing Risk Matrix

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<tr>
<td></td>
<td></td>
<td></td>
<td>• Zoom service changes</td>
<td>• Network interruption</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>at observatory</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• Keck polycom failure</td>
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<td></td>
<td>• Security incident</td>
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<td></td>
<td></td>
<td>due to remote observing</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>impact on Observation</td>
<td>Compromised</td>
<td>Interrupted</td>
<td>Night</td>
<td>Indefinitely</td>
</tr>
</tbody>
</table>

### Risk Severity, Impact

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Keck Observatory Archive

WMKO Team: Matthew Brown, Jeff Mader, Josh Riley, Luca Rizzi

IPAC Team: Bruce Berriman, Chris Gelino, Mihseh Kong, Anastasia Laity, Meca Lynn, Melanie Swain
## Projects

- DEIMOS/ESI full keyword releases (06/08/20, 12/12/19)
- pyDEP conversion (IDL to Python) for all instrument data processing (06/08/20)
- CentOS migration for operations
- pyKOA release for HIRES data access (10/14/20 - FY21)
- Table Access Protocol
- AAS video tutorials (06/17/20)
- NIRSPEC Europa gaseous plumes contributed data set (Paganini, 04/15/20)
- NIRC2 TRS data archiving and UI access (03/30/20)
- ingestionAPI implementation for software communication and removal of procmail
- KOA user group (membership finalized, Chairs are working towards a starting date)
- Real-time ingestion design started
- KODIAQ v3 contributed data set (Lehner/O’Meara)

No unscheduled projects or projects not compatible with current plan