MOSFIRE Status

- MOSFIRE arrived at the summit 2/16/12
- Installation plan at Keck 1 worked well
- Cool down started 3/8/12, reached operating temperature on 3/18/12
- First spectra (week of 3/19/12) showed optics and internal systems were all OK
- Mounted and balanced on the Keck I
- Successful First Light on April 4 & 5, 2012
MOSFIRE transportation to the summit of Mauna Kea
MOSFIRE placed safely inside the Keck 1 dome
MOSFIRE “lands” at RT1
MOSFIRE ready to install
Commissioning Night 1: 4/4/12

- Cirrus clouds throughout the night, some times very thick 😞
- Accomplished many of the planned tasks, including:
  - Established pointing origins (exactly as predicted for science field!)
  - Confirmed ability to guide with MAGIQ system
  - Calibrated rotator system for tracking while guiding.
  - Established orientation and handedness of instrument and guider fields
  - Confirmed alignment of pupil image with Lyot mask (alignment of instrument and telescope axes); established rotational zero point for pupil tracking
  - Obtained images to check MOSFIRE astrometric calibration and our assumptions about the telescope focal plane astrometry
  - Obtained night sky spectra in each band (Y, J, H, K, J2)
  - Obtained a few “pretty pictures” through clouds
  - Best MOSFIRE images: FWHM~0.4" over full imaging field

- Problem found with CCD Guider, corrected for second night
NGC5053 – star cluster at J

Difference of two frames

Images have FWHM = 2.5pix = 0.45"

Guider image
Antennae Galaxies – J-band

A 58 s exposure through clouds!
Antennae - zoomed
First slit mask – looking at sky

Slit mask image

OH Sky Spectra at H-band, 30 s exposure
Commissioning Night 2: 4/5/12

- Second night also thick cirrus with occasional clear periods
- Commissioning tests completed include:
  - Additional data for final check of FCS system with MOSFIRE on telescope
  - Verified new scheme for spectroscopic dome flats
  - Tested MOSFIRE calibration script
  - Verified guider is quite sensitive, working very well. Images obtained have FWHM~0.6" centered 6.7' off of the telescope axis
  - Tested scripts for offsetting telescope in various coordinate systems
  - Obtained super-long slit spectra of M82, M57
  - Successfully aligned our first slit mask, using “Slitmask Alignment Tool”
    - Stars in boxes, and in 0.7" slits, no tweak to PA needed
  - Obtained J-band spectra with automatic nodding between 2 slit positions
  - Continued verification that all mechanisms function as expected
  - Software generally in excellent shape; punch list of improvements based on experience on the sky
Afternoon of night 2, we tested a new spectroscopic flat field lamp system, verified that it works well for all MOSFIRE bands.

H-band flat for test mask (30 slits)
First Mask Alignment, MS Nod Sequence

Note stars in alignment boxes and in 0.7" slits!

Difference of two 120 s J-band exposures, positions +/- 1.5" along slit direction from fiducial
M82 in MAGIQ guide camera
M82 with MOSFIRE, J-band
Super-Long Slit spectrum of M82 in K-band

The slit is 6.1' long, the longest contiguous slit possible using any Keck instrument!

Lots of OH emission lines plus thermal infrared emission on the right
M82: Sky-subtracted K-band spectrum

Twist in spectra shows rotation of M82

- He I emission at 2.058 microns
- Bracket Gamma 2.167 microns
- H2 S1 (1-0) 2.122 microns
- CO band heads 2.295 microns
M57 ("Ring Nebula"): long slit spectra (difference of two nodded frames)

The MOSFIRE slit was vertical and cut through the ring nebula at these two points.

Molecular hydrogen emission (H2) extends far beyond the ionized hydrogen emission.

Note that the slit is 6.1' long.
Tests Postponed until next run

• Throughput tests in all modes (imaging and spectroscopy)
  – Need clear weather!

• Tests for differential flexure between guider and MOSFIRE field
  – Need at least some consistency in the transparency so that guide stars are not lost
Punch List

- Relatively short
  - CSU electronics don't work well cold; start working for $T_{\text{cab}} > 14 \, ^{\circ}\text{C}$
    - discussing with CSEM, may need to add temperature regulation to electronics cabinet cooling system
  - Electronics cabinet doors/cover modified successfully to eliminate interference with telescope yoke, but clearance is tighter than ICD
    - evaluate clearance in the case of a seismic event
  - Rotator encoder index is noisy, but rotator worked very well
  - Identified a few software improvements for better operator efficiency and error protection
  - All tasks, even minor ones, captured on Twiki
Stay Tuned!

• 8 more commissioning nights
  – May 4, 5, & 6
  – June 1, 2, & 3
  – June 26 & 27

• Planning to offer MOSFIRE for shared risk observing in 2012B
The Happy MOSFIRE Commissioning Team on April 5 2012

Many thanks to everyone who worked so hard and so long for this day.