

25 Jan 2011

Dear 90prime users,

This is a rather lengthy update and information sheet.
Please take the time to read it all.

Let us start by reminding you of the website for 90prime:

uao.itl.arizona.edu/90prime

This document will be posted there as well as sent to you by email.

I. CCD update

We are running 4 CCDs and 16 channels (amplifiers).

Chip 1 (amps 1-4) is the same as in Fall 2010, Chip 2 (amps 5-8),

Chip 3 (amps 9-12), and Chip 4 (amps 13-16) are new.

Chips are 4032x4096 physical pixels with 20 pixels of overscan for each amp.
So a raw frame is 4072x4096.

Scale 0.455 arcsec per 15 micron pixel.

Gap between CCDs is ROUGHLY 55 arcsec in Dec and 170 arcsec in RA.

Gain ~1.5 electrons/DN.

Saturation: >65000 DN but stay below about 60000 for safety.

Readnoise- ~9-10 electrons (see below)

Layout of the 4 CCDs

as it is on sky and

in quick look

3 4

N

1 2

E

Chips 2 and 3 show "spurious noise", which appears as vertical bars,
during readout. After processing, there will be extra noise as
f(y position) on those 2 CCDs. Taking readnoise as roughly 7 electrons,
spurious noise

adds a few electrons to the total noise. CCD3 is the noisiest chip.

SO, TOTAL NOISE is roughly 4-8 DN, or 6-12 electrons.

IT IS ABSOLUTELY MANDATORY to take enough zeros to create a master ZERO
to subtract in processing if you want to mitigate spurious noise
in your processed image. We suggest subtracting overscan line by
line (using "median" in IRAF-speak), trimming, the subtracting
a processed ZERO. AFTER FLATFIELDING, merge amps to get a MEF file
with 4 extensions. [If you merge before flatfielding, you won't have
normalized the amplifier gains properly.]

Chips are being processed at ITL that might replace chips 2 and 3.

II. Setting up at beginning of the night

YOU NEED TO INITIALIZE EVERY NIGHT FOR ACCURATE POINTING.

The operator knows how to offset the calculated distance between the center of chip 1 and the center of the focal plane. Dave Harvey wrote them commands to use in TCS.

FOR FOUR-CCD USE: center bright star on CCD1, offset to center of entire focal plane (hard to see because you're in gaps, but there's code for this so don't worry), then initialize.

The embedded WCS is reasonably accurate. You can see RA/DEC in quick look or by loading an image in DS9 (as opposed to using IRAF commands to load the image).

FOR ONE-CCD USE (CHIP 1): Center on chip1, tell operator to initialize (no offset). Embedded WCS is still ok.

FOR ONE-CCD USE OFFSET FROM CENTER: If you do not want your special object to fall on the intersection of 4 amps, you might set up and initialize somewhere else on Chip 1. All bets are off for the embedded WCS.

For many uses (coadding of data, automatic detection of standards, etc) you'll likely want to improve the embedded WCS. There are IRAF routines, for example to do this. Even if you use IDL or something else, you can learn a lot by saying "help mscguide" in IRAF's MSCRED.

Even better is the website

iraf.noao.edu/projects/ccdmosaic/reductions/adaa/valdes2.ps

and

iraf.noao.edu/projects/ccdmosaic/generic/generic.html

Note that users regularly use mscred in iraf to reduce 90prime data easily.

III. Fringing

These thinned, backside-illuminated CCDs fringe a small amount at the wavelength of SDSS r' filter, even more at SDSS i', and even more at SDSS z'. You need to take appropriate data to create and later subtract scaled fringe frames. Remember that the 8000-10000 Angstrom sky is highly variable with changing emission lines, thus changing relative intensity of fringes in the fringe pattern.

IV. Pointing

On 24/25 Jan 2011, Dave Harvey, Dennis Means, Mike Lesser, and Edward Olszewski derived a new pointing map, and the pointing is much improved.

If you see, after careful start-of-night setup and initialization, that the pointing is off by ~arcmin as you move through the sky, please let us know. This MAY indicate a mechanical problem that we would need to find and fix.

V. Shutter

The shutter has recently been tested at ITL and at Steward. On the mountain on the two nights of Jan 23 and 24 we saw no shutter failures. We realize that there were some in Fall 2010 and are still testing and changing out boards, etc.

VI. Guider

PLEASE REMEMBER TO HAVE OPERATOR INITIALIZE GUIDER after each guider power-down. We note that optimal guiding time is ~1sec, giving about 3 sec between guider commands to TCS (2 sec readout). We are working on reading out a subregion and will let you know if/when tht routine works. Telescope cannot respond to commands faster than every 1/2-1 sec anyway.

VII. Focus

We tested focus frames with a wide variety of step sizes, and could never make the focus routine crash, as some observers reported in Fall 2010.

While we do not see hysteresis on the stepper motors, we anecdotally report that moving 30-60 stepper motor steps from best focus as determined by the focus sequence seems to improve the images. WE DO NOT KNOW WHY, and user beware. (If you ran focus with +30 unit steps, and set best focus, the true best focus MIGHT BE -60 stepper motor steps from there. We don't know why.)

So, in other words, run focus sequence, determine best focus, set best focus, take a short image, move focus a few 10s of stepper motor steps, and take another short frame. See which one is better. We certainly might be wrong about this.

VIII. Nominal Plane

We have reasonably successfully flattened the focal plane on the sky. We have changed the nominal plane variable in the Filter Wheel GUI. It's not perfect at this moment, but not bad. We hope to make it even better. We remind users that aberrations grow quickly as you get out of focus, so the corners can look really bad if you're slightly out of focus. If you're in focus, they look pretty good.

IX. Disk Space

As always, we encourage users NOT to delete their data on disk. BUT we remind you that your data can be deleted starting the moment you leave the mountain. It's useful to leave data on until the disk starts to get full.

If you need to delete other's data on /data/primefocus, delete the oldest directories first. We can track down problems if data are on disk.

This is a good time to remind you that STEWARD pays NOAO for internet BY THE BIT (more precisely, by the PERCENTAGE of bits we send each month). Copying a night's data downtown or to the East Coast or Korea from the mountain is STRONGLY DISCOURAGED-- it's free from downtown and expensive to Steward from up on Kitt Peak.

USB drives connected to laptops and filled using the LAN are really cheap and can be used more than once. STJUKSHON (bok) has 2 USB ports behind its front door.

[We note here that shortly after Jan 31 a new STJUKSHON will be installed.]

X. BokCCD and BokCCD2 computers

The windows machine is called BokCCD. It's in the same rack as STJUKSHON. You also need to be running BokCCD2 (BokCCD1 is for the B&C spectrograph).

If you need to reboot the windows machine, you have to reboot both.

XI. Flatfield Lights and Screen

It's very hard to illuminate the flatfield screen uniformly. That said, we imagine a hybrid process of dome flats and a small number of skyflats, though we like to use skyflats alone ourselves. But in the limit of lots of clouds, dome flats might save your data. We cannot give you a recipe but note that various IRAF help files and websites describe a hybrid procedure.

The same computer rack has "flat field lamp controller" with a choice between regular halogens and special UV-bright lamps. The UV lamps take a while to reach their desired temperature, and are NOT DIM-able. the Halogens are DIM-able by a slider switch on the wall near the LN2 vessel for 90prime.

XII. Twilight Flats and Operator Work Hours

Please fill out your observing forms with your filter needs, twilight flat needs, dorm needs, etc, and send to 90ops@as.arizona.edu with a copy directly to Bill Wood (bwood@as.arizona.edu).

REMEMBER, operators only get paid for the time interval 1/2 hour after sunset to 1/2 hour before sunrise. In this model you CANNOT get ANY twilight flats. You can ask for the operator to come in just before sunset, which means he gets to go home 1 hour before sunrise. This allows you to get evening flats.

XIII. Dewar

The dewar has a 2-day hold time, but needs to be filled daily to keep the telescope balanced. The operator will do this, usually right after you finish taking twilights and before it's dark enough for real observing.