LRIS Multi-Slit Obs

I. Prior to Arrival

  (a) Prepare slit masks ($\geq$2 weeks in advance)
  (b) Fill out instrument configuration form
    i. Can request 9 slits (e.g. 1 longslit & 8 slitmasks)
    ii. 4 gratings, 5 filters (e.g. BVRI & order-blocking)
    iii. Slitmasks take at least 2 days to mill
  (c) Create a method for identifying the mask guide stars
    i. This is crucial
    ii. Finding charts, sub images, etc. - labelled
    iii. Bring labelled version of slitmask printouts too

II. Afternoon of the First Night (hectic)

  (a) Multitask:
    i. One guy runs the instrument
    ii. One guy analyses the output
  (b) Transfer all relevant files to the system (could be done a day in advance)
  (c) Get started as soon as instrument is available
    i. hit LRIS startup from menu
    ii. check web help page to run *copymon*
    iii. make file /kroot/starlists/wolfe/anyname, syntax:
    name RA(starts 17th column +-hhmmss no spaces within hhmmss) DEC 2000.0
    iv. FIGDISP always starts with weird center & zoom - hit normal, center
    v. start with darks (1s) - sometimes first image is garbage!
  (d) Focus the instrument – if necessary (when isn't it???)
    i. Focus should work fine with value on the wall
    ii. Any additive offset in that value can probably be applied to all numbers (but check!)
    iii. Take a series of arc line exposures (1s) at a range of focus values - vary by 30 microns at a time
    iv. Use IRAF to find the minimum FWHM - use imexam + 'j'
  (e) Initialize each mask
    i. Look for defects, etc. in the slits
    ii. Centroid the grating
      - Can set effective wavelength with angle (most repeatable) or MS Wavelength (NOT plain Wavelength!).
      - **Don't change angle and grating at same time!** Everything else can be switched in parallel
      - The setting needed depends upon turret position
      - Make sure all relevant light is on the CCD (order blocker $\rightarrow$ 10000Å)

- For $z \sim 4$ we only care about 4000-8000 A
- Fewer arc lamps are typically easier to handle
- Not too hard for 150 line grating

iii. Test flat exposure times ($\geq$ 3s)

iv. Mirror in grating out

v. Take an **unsaturated** direct image of the mask for aligning

- 2s exposure with R filter + Arc lamp (e.g. Kr)
- Probably won't use this frame later on but...
- Use *rmcursor > coordlist.xy* to get x,y of all boxes in a text file
- Remember the order! e.g. top to bottom

(f) Build a set of KICS files (macros) for each mask (Arcs, Flat, science)

(g) Check xbox and other tools

(h) Get dinner if you can!

III. Pre-Observe

(a) Snap a frame or two of twilight sky for fun

(b) Have OA run malign to focus as soon as you can, after setting LRIS to R band - we can't change LRIS settings while malign is run

(c) OA tells us average fwhm which is usually 0.1-0.2" worse than true seeing

(d) Decide on slit width if applicable

(e) Proceed to align before 18 degree twilight

IV. Aligning (the stress)

(a) Take an image of the slitmask (hatch closed, lamp on)

(b) Take an image of the field (30−60s)

(c) Find one star and measure offset with IRAF - there are 42 prepix there - x_iraf = x_figdisp + 42

(d) Offset with guider (or OA)

i. An IRAF tool exists to help with this: imoffset x_old y_old x_new y_new

ii. It was not functional on Run 1, so we used handpaddle to implement offsets

(e) Once 1 object agrees well, take image of field+slit (hope for a star or three)

(f) Run xbox: *xbox image.fits coordlist.xy*, implement PA & x,y shifts

(g) 0.3 deg is always first PA so anticipate that

(h) Once PA < 0.03 deg don't use it - due to dumb programming fit is wrong then, offsets are enough

(i) 15 min or less is a job well done

(j) Begin science

V. Science

(a) Switch to grating

i. Expensive move (nearly 5 minutes)

    ii. Center the grating if necessary (use KICS)

(b) Take multiple 20−30 minute exposures (30 is better due to reduced readout noise)

(c) Dither $1 - 2''$ along the slit with hand paddle ($\pm y$). $1''$ is necessary if objects are near the ends of slits, $2''$ gives you better fringe subtraction (not important for $z \sim 4$).

(d) Look for stars and bright objects after each exposure

VI. Calibrations

(a) Close hatch – **Do not slew**

(b) Take 1 (or 2) arcs (1s) + 2 flats (?s)

(c) Quickly check calibrations by eye (you only get 1 arc)

(d) Switch to mirror and next field

VII. Odds and Ends

(a) Alignment requires at least 2 clear thinking people

    i. One runs the instrument (mask in, mask out, etc.)

    ii. The other runs xbox + calculates offsets

(b) Check focus throughout the night during alignment phase

    i. Run malign if objects appear significantly distorted

    ii. 10−15 minute overhead

(c) Never relax (except during long exposures!) :)

(d) Make data tape with *tar -cvf /dev/rmt/1lbn* lris11 then *mt -f /dev/rmt/1lbn offline* to eject