FOCUSING BLUE/RED CHANNEL USING ‘SPECFOCUS’

This is a brief tutorial on focusing the MMT Blue and Red Channel spectrographs using the IRAF spec-focus routine.

1. From the IRAF cl prompt, load the ccdacq package:

   ecl> ccdacq

2. Edit the lampfocuses parameters.

   ccdacq> epar lampfocuses

   IRAF
   Image Reduction and Analysis Facility
   PACKAGE = ccdacq
   TASK = lampfocuses

   nexpo = 11  Number of exposures
   fstart = 1.8 Starting focus value
   fdelta = 0.1 Focus increment
   exptime = 30. Exposure time (seconds)
   complamp= HeAr/Ne  Comparison lamp
   objectti=  focus   Object title
   (verbose= yes)
   (mode = ql)

3. Run lampfocuses

   ccdacq> lampfocuses
   Number of exposures (1:) (11):
   Starting focus value (1.8):
   Focus increment (0.1):

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Exposure time (seconds) (0.:16000.) (30.):
Comparison lamp (HeAr/Ne):
Object title (focus):
image `focus0003' will be written to disk...

4. Edit the parameters for specfocus which is in the noao, obsutil package:

```
ecl> noao
  artdata. digiphot. nobsolete. onedspec.
  astcat. focas. nproto. rv.
  astrometry. imred. observatory surfphot.
  astutil. mtlocal. obsutil. twodspec.
```

```
oao> obsutil
  bitcount cgiparse kpno. psfmeasure specfocus sptime
  ccdtime findgain pairmass shutcor specpars@ star
  focus
```

```
obsutil> epar specfocus
```

Because the focus values are saved in the image header you can use the header keyword INSFOCUS for the focus values. You can limit which images to use by using wildcards, e.g., focus*!{4-8}.fits. You can also use the IRAF @filename convention where filename contains a list of images to process.

```
 IRAF
 Image Reduction and Analysis Facility
 PACKAGE = obsutil
 TASK = specfocus

 images = focus*.fits List of images
 (focus = INSFOCUS) Focus values
 (corwidt= 20) Correlation width
 (level = 0.5) Percent or fraction of peak for width measurement
 (shifts = yes) Compute shifts across the dispersion?
 (dispaxi= 1) Dispersion axis (long slit only)
 (nspectr= 1) Number of spectral samples (long slit only)
 (ndisp = 1) Number of dispersion samples
 (slit1 = INDEF) Lower slit edge
 (slit2 = INDEF) Upper slit edge
 (logfile= logfile) Logfile
 (mode = ql)
```

5. Run specfocus:

```
obsutil> specfocus
```

List of images (focus*.fits):

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The result is the plot shown below:

SPECFOCUS: NOAO/IRAF V2.14.1 mmtobs@alewife.mmto.arizona.edu Wed 01:09:04 26-Aug-2009
Best average focus at 2.15 with average width of 3.07 at 50% of peak

-- Average Over All Samples

<table>
<thead>
<tr>
<th>Image</th>
<th>Focus</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>focus0014.fits</td>
<td>1.8</td>
<td>3.22</td>
</tr>
<tr>
<td>focus0015.fits</td>
<td>1.9</td>
<td>3.15</td>
</tr>
<tr>
<td>focus0016.fits</td>
<td>2.0</td>
<td>3.09</td>
</tr>
<tr>
<td>focus0017.fits</td>
<td>2.1</td>
<td>3.08</td>
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<td>focus0018.fits</td>
<td>2.2</td>
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<td>focus0019.fits</td>
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<td>3.10</td>
</tr>
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<td>focus0020.fits</td>
<td>2.4</td>
<td>3.17</td>
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<td>focus0021.fits</td>
<td>2.5</td>
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<td>focus0022.fits</td>
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<td>focus0023.fits</td>
<td>2.7</td>
<td>3.56</td>
</tr>
<tr>
<td>focus0024.fits</td>
<td>2.8</td>
<td>3.75</td>
</tr>
</tbody>
</table>

-- Image focus0017.fits at Focus 2.1 —

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6. If you do not pass through focus, adjust the collimator range and repeat the task. **Maximum** focus value is 4.776. Enter the best focus value determined from `specfocus` into the ‘focus’ box in the control GUI. Click “Configure Spectrograph” at the bottom of the GUI for the new configuration to take effect. Please note that the focus value may change with outside temperature. In our experience, the Blue Channel focus value increases 0.1 units for every 1 degree Fahrenheit decrease.