

## ASTR 288C - Astronomy Research Techniques

Fall 2019

### Homework Assignment No. 6

1. Write an IDL procedure to do (crude) aperture photometry. This routine should (1) integrate all the flux within a circle of radius "rc" centered at (xc,yc). (2) integrate all the flux within a ring of inner radius "ri" and outer radius "ro", with the same center (xc,yc). (3) Scale the flux from the ring by the ratio of the (rc area)/(ring area) and subtract this "background" from the total flux within the "rc" circle to obtain the corrected flux.

2. Go to the Hubble Legacy website

<http://hla.stsci.edu/hlaview.html>

and search for images of the planetary nebula BD+30 3639 (also called PK64+5D1).

Last week you measured the flux from the narrow band H-beta image (f487n) taken in 1994: (proposal 05403 - HARRINGTON): `hst_05403_02_wfpc2_f487n_pc_drz.fits`

You will find many other narrow band filter observations taken as part of that observing proposal.

- Download and examine files taken through other narrow filters. In particular, f656n ( $H\alpha$ ), f658n ([N II] 6584), f375n ([O II] 3727) and f953n ([S III] 9532). Use the IDL `readfits` procedure.
- Look at the headers of each. Find the inverse sensitivity `PHOTFLAM` and the filter bandwidth `PHOTBW` and save the product of these values. (You will use these numbers to convert counts to flux in ergs/s.)
- Use the "ring.pro" procedure to measure the counts in each filter, excluding the central star. Convert the counts to flux units ( $\text{erg s}^{-1}$ ). Make a list of the ratios of each flux to  $H\beta$ .
- Look back at the lecture notes `Lect-2.pdf` and note the Balmer decrement shown in Table 14.2. Compare the ratio of  $H\alpha$  to  $H\beta$  from your measurements with the theoretical ratio. Comment on the difference.

In the directory Astronomy 288C on my webpage,

<http://www.astro.umd.edu/~jph/A288C.html>

there is a file with the predictions of a computer model of BD+30 3639. Compare the predictions with your measurements of the line ratios.

**Due: 21 October 2019**