

Name: _____

ASTR500: Mock Cumulative Exam Question #8

A Survey of $z \gtrsim 5.7$ Quasars in the SDSS IV: Discovery of Seven Additional Quasars (Fan et al. 2006)

14th April, 2009 – Jeff Coughlin

The authors discuss SDSSJ1335+353, a high-redshift quasar with no detected Ly- α emission. They find the 3σ limit on the equivalent width to be 5\AA , while typical high-redshift quasars have equivalent widths of $70 \pm 15\text{\AA}$. Assume that the lack of line detection in this quasar is due to the line being greatly broadened (bonus points for suggesting a physically viable mechanism). Now, the amount of broadening would not change the equivalent width, but let us take into account observational errors!

Assume that the continuum has a flux of 100 counts per pixel, and the plate scale is 10 pixels per Angstrom. Assume that a feature with an equivalent width of 70\AA is contained in a single pixel, and that the errors are Poisson. What is the S/N of this feature?

Now assume it is spread out over 10\AA – what is the S/N of each pixel of this feature? What is the S/N of the whole feature? You may assume that the feature takes on a box shape for simplicity, i.e. no need to try and figure out some complicated gaussian profile.

Now assume it is spread out over 1000\AA . What is the S/N of each pixel, and of the feature as a whole?

Discuss the probability of detecting the feature at this last broadening value.