2013 Balmer Comments: Grating

GRATING

1. Tune the spectrometer with the Na doublet.
Measure the doublet position for m=2, 1, 0, -1, and -2.
Note for 0 you may see a very bright line and a much less bright line. Only the very bright line is important.
For the doublet in m=1, examine the effect of the "paper stops" on the width of each of the lines of the doublet.
(The paper stops are attached with the magnets and are used to change amount of light incident on the grating.)
Reduce the separation between the stops. Once the "stops" are about 4 mm apart (about the center position) each line starts to blur. By the time the "stops"-slits are 2 mm apart the lines much more blurred. Actually we would expect the loss of resolution (blurring) to be more gradual - it should be linear with separation. There is little loss in resolution until the stops are close together because the light incident on the grating is not uniform.

2. Calibrate the spectrometer with the Hg lamp.
Use the usual 4 lines and measure the positions for m=2, 1, 0, -1, and -2

3. Balmer lines.
Try and measure Balmer alpha, beta, gamma and delta for as many orders as possible.
You should be able to observe
Alpha, beta and gamma for 2, 1, -1, and -2.
Delta is harder to see, but with the slits open and a very dark room you should see it for 1 and -1.

The isotope shift is best observed on m= -2, but with the age of the tube it is getting more and more difficult to see. If you can not see it, I can share data from the past. But I do want you to know why there is an isotope shift.

4. Mystery gas.
Only look at the brightest lines (m=1 is sufficient) and compare to the bright line spectra poster.
Those are the only sources you need to examine.

Once you have your data put is into excel.

For the Na and Hg lines you can CALCULATE the wavelengths of the lines and compare them to the known wavelengths.
For the Balmer lines you can see how well they fit the Balmer formula that you develop.