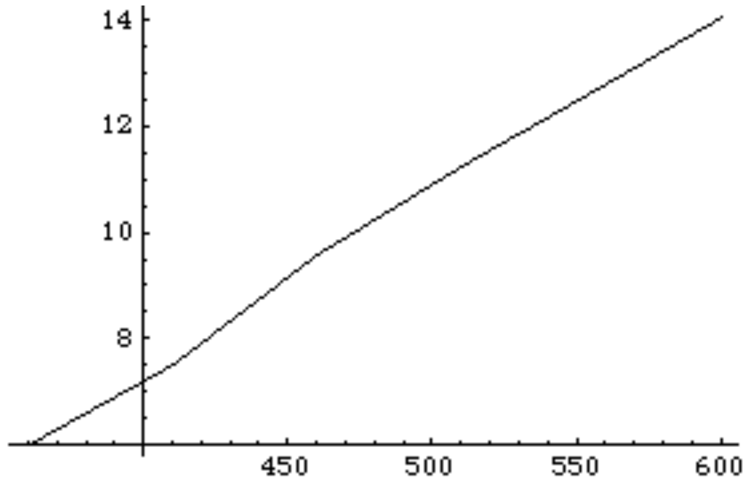
Notes on Palomar Visit May 18-May 22 2006

(1) We had problems with the Burleigh spectral analyser that took up much of the time. We were able to see the modes in the 0.633 nm laser fairly easily and guess that the actual finesse of the laser is about 80- 100. The mode spacing is 435 MHz. However for most of the measurements we found that ,if we scan over many orders, the peak heights of the lines in different orders are different but repeatable. The effect was the same for the He-Ne as for the SF laser so we assume that this is an artifact of the Spectrum analser. The instrument has a device that is supposed to clamp the etalon which did notwork. We rebuilt the spectrum analyzer and mount and this problem largely went away. Most of the measurements were made before the rebuild.

(2) The measured linewidth for non-mode locked line was 2.5 GHz FWHM. For mode locked pulses in this laser/test setup the linewidth was 3.1 GHz. Adjusting the etalon and phasing the mode locked pulses reduced the linewidth to 2.0 GHz.

(3) The spectrum analyzer can be (and currently is) permanently mounted in the laser. We need another oscilloscope to display the linewidth because the current digital scope is needed to monitor the condition of the laser and we need this data to make any progress. We need a simple low bandwidth scope capable of displaying (x,y) data with a variable persistence and we need to buy this before the next run. The display would be enhanced by having a sample/hold triggered to the laser pulses. The current laser seems to have a feature that it only records data when a level is above(or below I forget) threshold. The laser pulses we have access to are the wrong polarity and this signal should be inverted. The point is that we should talk to the manufacturer before buying the scope and explain the problem , which is that it's a pulsed system and we only want to display data when the laser pulse is on.

(4) The 1.06 μ laser tuning is very sensitive and , as we have all noted, the return signal depends critically on the etalon angle, its very difficult to tune off and on the line in a repeatable way. The 1.32 μ laser is less sensitive. We made measurements of the frequency shift as a function of etalon position. This is shown in the following graph. The vertical axis is the shift in GHz against the etalon micrometer reading in μm. Changing the micrometer position of the 1.32 μm etalon by 29 μm changes the output frequency by I GHz. The transmission of the cell is completely opaque when the laser is tuned to the D_2 line over a range of at least a GHz so we are probably not setting the tuning position to within a 1GHz. This has a big effect on the return.



(5) There are two problems therefore:

(i) Determining the actual center of the D_2 line. Looking by eye at the transission minimum is not going to cut it. We need at the very least a Readout of the transmission or light output of the sodium cell. The Lidar people use a sodium lamp and fire the laser into the sodium lamp and measure the current going through the lamp. There is a very sensitive dip of the current when the laser is correctly tuned. This is called the photo-galvaic (??) effect for people who want to goggle. Whatever we use we need a dither servo to lock on the sodium line asap.

(2)

(1) A few things need to be fixed in the Coude Lab :

(i) we need light bulbs replaced, the room is so dark at the moment that it represents a safety risk.

(ii) We need better storage for equipment

(iii) We need the platform extended. Its very uncomfortable and risky working on a laser is such confined space.

(iv) We need to put the Lyntron chiller back. The reason it kept on tripping out was that the primary filter was blocked. With the Neslab chiller pumping at 70 psi there was only 35 psi max across the diode lasers with a flow rate of 1.35 gpm from the chiller, when the laser cooling was on bypass mode the maximum flow was 2 gpm. We have changed the filter and the bypass flow is now 6 gpm max. The laser should not be operated with a flow of less than 20 gph through the diode lasers.

(v) The Neslab chiller has to be moved downstairs.