

June 6, 2007 Laser Meeting Minutes

A. Bouchez

Attending (by phone): Bouchez, Tripathi, Shelton

1. Laser performance during the last engineering run

- Renu realigned 1.06 μm cavity from scratch just before run.
- 1.06 μm laser power was stable at 10W throughout run. Renu removed polarizers and opened the iris - only optics in the 1.06 μm cavity were the etalon and KTP crystal.
- 589nm power started around 4W each afternoon and rapidly climbed to a very stable 5.0 W for the remainder of the night.
- Mode quality (spot shape) observed at the LLT pupil was poor and variable. The beam would "blow up" and "break apart" for a second every 3-5s, and was unusually elongated (1:3 aspect ratio).
- Logging of laser power to AO database was tested but not successful.

We have 6.5 wks until next run begins; an unusually long period for development of the laser system.

2. Laser automation

Team: Chris, Renu.

- Na lock was not working properly last run. Lock would break several times per night, and Renu would readjust etalon to recover.
- Chris suggests that we practice using temperature control to recover next time.
- We concluded that the lock breaking was probably an SNR issue, exacerbated by the mode instability noted above.
- SNR improvements suggested by Chris:
 - Replace preamp on photodiode with something better.
 - Improve optical coupling between cell and photodiode.
 - Optimize thermal properties of cell (keep Na from plating out on optical surface).

Action items:

- Chris will recommend a photodiode preamp, Antonin to order, Renu to install.
- Chris will design an acrylic cylindrical lens with heater. This could be made at Palomar, or sent to Antonin for assembly by the Caltech physics shop.
- High priority placed on having working logging of laser power and temps for next run (Steve G.)

3. 1.06 μm laser mode control

Team: Ed, Renu, Chris

- Ed has proposed increasing pump region eliminate the parasitic mode. Chris points out that this would possibly require changing HR, and addition of an intracavity lens.
- No one present has performed the mode calculations (pumping volume, mode volume) for the 1.06 μm laser. We would need the radius and reflectivity of the HR, dimensions of the cavity, and refractive indices of all elements.
- Chris worked out the tolerancing of the entrance angle to the Nd:YAG slab and found it to be ± 0.05 , and points out that the laser does not have the degree of freedom necessary to adjust this angle. Index difference with HeNe is huge, so cannot use this for alignment. Need to follow up this concern with Ed.
- Renu on one occasion got the current gain module to produce 26W. Alignment within the slab was extremely good, as power was linear with rep rate, and no beam shift was observed between 100 and 400 Hz. This suggests that the current cavity design could may be OK, and all we need is better alignment techniques or tools.
- All agreed on moving forward with Ed's plan to increase pump region. If unsuccessful, we have sufficient time before next run to revert to previous configuration.

Action items:

- Renu will attempt to recreate 26W alignment, and measure mode purity before Ed's arrival.
- Renu will work on documenting a model of the 1.06 cavity. Ed may have some of the necessary info and equations already worked out.
- Chris will prepare proposal for an alignment jig, to be discussed with team next week.

4. Sum frequency conversion

Team: Renu, Ed

- Two ways forward mentioned:
 - Match beam sizes of IR lasers.
 - Try different crystals (new LBO, BBO, PPSLT,...)
- All of this work must wait until the problems with the 1.06 μm laser are solved.

5. Scheduling

- Ed arriving June 12, leaves June 20.
- Chris and Antonin will go up to Palomar for an in-person strategy session with Ed and Renu soon after he arrives, June 12 or 13.
- Renu out the office June 21-22.
- Chris may go up to Palomar part of the week of June 25 to work on Na cell and anything else which needs attention.

Meeting adjourned at 9:50am.