

Palomar Adaptive Optics Test Plan

Title	Laser power-up
Version	2.1
Date released	8/8/2007
Lead	V. Velur
Time requested	1 hr prior to laser use
Required conditions	N/A

Purpose

- Safely power up laser.
- Optimize laser power, frequency tuning.
- If necessary, reduce power for alignment procedures.

Test procedure

A. Power up laser

1. Top up water in large chiller.
2. Switch on both chillers (button/switch on front of each).
3. Check "load center Coude camera room" circuit breaker. Reset any necessary (10 & 12 often trip when shutting laser down)
4. Press white button on laser controller, labeled "Laser Flow".
 - 4.1. Pressure should read ~55 PSI, flow should read ~0.7 Gal/Min.
5. On temp control laptop, right-click on each window and restart display (on 1.06 AOM, 1.06 Etalon, 1.32 AOM, 1.32 LBO). Wait for temps to stabilize.
6. Verify that both IR beams are blocked (two flipping blocks, one next to 1.32 diodes, one near SFG)
7. Verify that laser function generator is set to 1 (=10 Hz pulses)
8. Switch photodiodes on (1.06, 1.32, 1.06 diode).
9. On both diode power supplies (Analogue Modules):
 - 9.1. Turn key switch to on.
 - 9.2. When alarm stops, hit "A" (pulse mode operation)
 - 9.3. Press "run" (**High power IR – green or purple goggles required**)
10. Turn up laser function generator dial to 30 (=300 Hz pulses).
11. Verify that both lasers are lasing. Pulse shape should now look reasonable.
12. Verify that LBO temp display is at ~40.1 C (lowest left in rack).
13. Press "enable" on Na cell temp controller (lowest right in rack).
14. Check 589nm unmodelocked power.
 - 14.1. Turn on power meter and insert in beam just ahead of output optics.
 - 14.2. Zero power meter.
 - 14.3. Open IR beam blocks (**High power 589nm – purple goggles required**)
 - 14.4. Record power.
15. Verify that IR beams shapes are good in spiricon display (*possibly obsolete!*)
16. Mode lock IR lasers.
 - 16.1. Turn "1.06 power adjust" knob clockwise until you reach black mark (=2).
 - 16.2. Turn "1.32 power adjust" knob clockwise until just above black mark (=4).
 - 16.3. Adjust 1.32 cavity length using micrometer near diodes to clean up mode locking (make clean comb). Can also use x-y aperture in bow-tie for final

- cleanup (caution - touchy!)
17. Adjust "Phase Control" knob until 589nm power is maximized.
 18. Turn on chirping: Set "output" knob of pulse generator such that output of PZT driver reads ~100 mV peak-to-peak.
 19. Repeat step 16.3 to clean up mode locking.
 20. Frequency adjustment (when Na cell has reached ~69 C)
 - 20.1. Adjust horizontal actuator on 1.06 etalon to maximize fluorescence as seen in oscilloscope output.
 21. Record power and remove power meter from beam.
 22. Laser is ready for observing.

To change to low power for alignment, dephase the IR lasers by adjusting the "phase control" knob to achieve desired power.

Laser optimization

1. Laser optimization, level 1
 - 1.1. Adjust the "Phase Control" knob until 589nm power is maximized.
 - 1.2. Adjust the 1.32 intracavity lens x-y position, to maximize total 589nm power and minimize 1.32 laser turn-on time (the two should be correlated).
 - 1.3. Adjust the 1.06 cavity length using the manual actuator on the 1.06 output coupler z stage, to maximize total 589nm power and minimize 1.06 laser turn-on time. Beware of burning your fingers!
2. IR laser optimization, level 2 (expert users only) (*possibly obsolete!*)
 - 2.1. Block 1.32 cavity using intracavity flip mount. Remove 1.32 etalon by removing post from mount. Open intracavity flip mount.
 - 2.2. Maximize 1.32 power by adjusting x-y position of intracavity lens (use oscilloscope trace)
 - 2.3. Replace etalon as in step 1.
 - 2.4. Block 1.06 cavity using intracavity flip mount. Remove 1.06 pinhole by unscrewing pinhole from x-y lens mount. Open intracavity flip mount.
 - 2.5. Maximize 1.06 power by output coupler z stage (use oscilloscope trace).
 - 2.6. Replace etalon as in step 11.4

Results and conclusions

8/8/09 startup

- 1.32: 8.20 W after adjusting x & y of intracavity lens. Some squiggle in trace.
 - 1.06: 13.6 W with no adjustments. Would adjust x-y of aperture in bow-tie if nec.
 - 589nm: 3.15 W w/ no mode locking. 7.50 W with chirping on, after all adjustment.
- Note: Chirping destabilized 1.32 cavity length, required careful adjustment of micrometer.