

aLIGO high power laser maintenance (LIGO-T1200118-v2)

(Benno Willke, 14 Nov 2014)

weekly level 1 maintenance:

- once a week the current of all four diode boxes should be adjusted such that the reading of the pump light monitors on the Beckhoff screen is at 100% (if the pump light monitor is not yet set to relative values (%) bring the absolute power level back to the value it had after installation or after the last level 2 maintenance)
- if the weekly maintenance procedure does not bring the laser power reading of the HPL monitor diode (on EPICS screen) back to within 3W of its nominal value perform a level 2 maintenance (the *nominal value* is defined as the reading of the HPL monitor diode after the last 'level 3 maintenance')

level 2 maintenance:

- if the weekly maintenance procedure does not bring the laser power reading of the HPL monitor diode (on EPICS screen) back to within 3W of its nominal value the following level 2 maintenance is due:
 - the temperatures of each diode box has to be optimized (not of the diodes separately), the center wavelength should be set to $807,8 \text{ nm} \pm 0.3 \text{ nm}$ (see laser manual LIGO-T0900641 for procedure)
 - check the power of the front-end (on HPL PDAMP) and correct it to the nominal value (see T1200560) ; unless there is clear indication from the trends of the FE pump-light monitor photodiodes that one diode degraded faster than the others, increase the current through all diodes symmetrically)
- if these two adjustments bring the HPL monitor diode reading back to its nominal value, the current diode box currents have to be set to '100%'
- if these two adjustments do NOT bring the HPL monitor diode reading back to its nominal value perform a level 3 maintenance

level 3 maintenance

- check the wavelength spectrum of each diode box and adjust the temperature of each diode if necessary
- check the beam profile and alignment of the corona aperture and the laser if necessary
- check the injection-locking error signal and optimize the alignment of the FE into the HPL oscillator cavity

level 4 maintenance (requires personal trained in HPL oscillator alignment)

- check the power reflected by the brewster plate and align the 4f imaging system if necessary