

# Direct-Pumped Nd:YLF Laser

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## Motivations

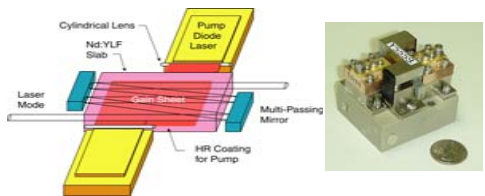
- To improve the optical efficiency of the Nd:YLF laser by employing direct optical pumping of the upper level of the 1-micron laser transition.
  - pump at 863 nm instead of 808 nm.
  - predict 10% improvement in the optical efficiency.
- To reduce the quantum defect between the pump photons and the laser photons. This leads to a decrease in the thermal load in the laser crystal itself.
  - predict 10% decrease in heat load.

## Conclusions

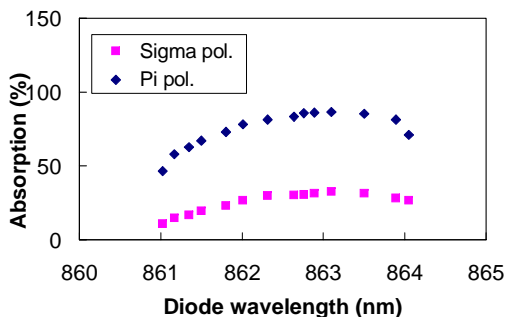
- In this work we have demonstrated an improved laser performance for Nd:YLF operating at 1047 nm by directly pumping the upper laser level at 863 nm.
- We measured an 11% improvement in the optical slope efficiency of a normal-mode oscillator by replacing the conventional 806-nm pump diodes with 863-nm diodes.
- Improved efficiency and reduced heat load is of importance in a space-based system.

## Acknowledgement

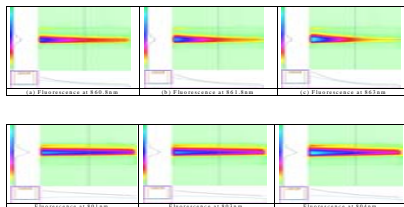
This work was funded by NASA Phase I SBIR (Contract # NNX08CC28P).



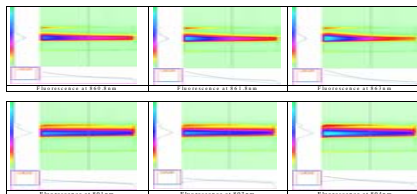
Side pumping in the Nd:YLF crystal.



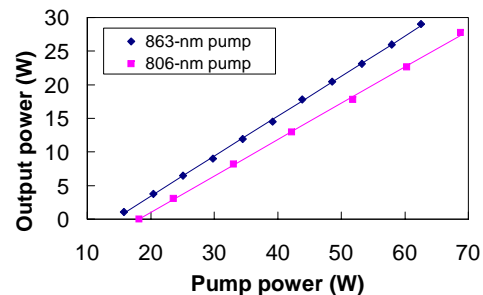
Absorbed power as a function of wavelength.



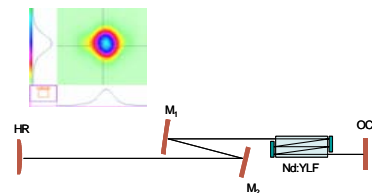
Fluorescence profile in a 1.5% Nd-doped YLF laser crystal.



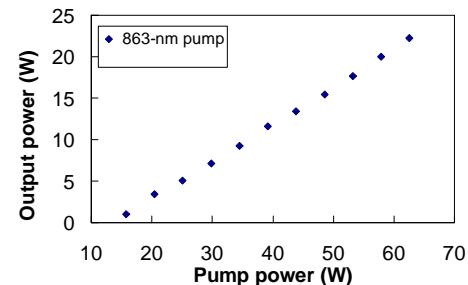
Fluorescence profile in a 1% Nd-doped YLF laser crystal.



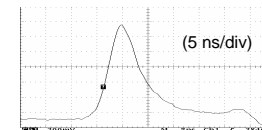
Output power as a function of input power for two different pump diodes.



Schematic of laser resonator. HR: high reflector, OC: output coupler, M1: spherical concave mirror with 75-cm ROC, M2: cylindrical convex mirror with 20-cm ROC.



Laser output power as a function of input power in the TEM<sub>00</sub> operation.



A typical Q-switched laser pulse at ~6 mJ output.