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.
- We generated 25 mJ of energy in a Q-switched and multimode beam with a 100 mJ of pump diode energy.
- Improved efficiency and reduced heat load is of importance in a space-based system.
- We designed a compact and rugged package size: 24.5 x 14 x 10 cm\textsuperscript{3}, weight 3.5 kg.

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