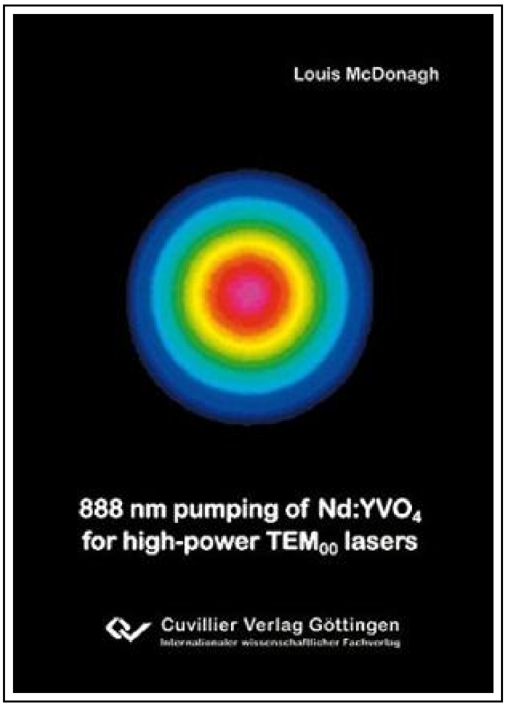
888 nm pumping of Nd:YVO4 for high-power TEM00 lasers



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888 NM PUMPING OF ND:YVO4 FOR HIGH-POWER TEM00 LASERS

Cuvillier Verlag Feb 2011, 2011. Taschenbuch. Book Condition: Neu. 208x146x17 mm. Neuware - For the last decade, neodymium-doped orthovanadate has established itself as the activematerial of choice for commercial solid-state lasers emitting in the 1 µm range, with output powersfrom several hundred milliwatts to a few tens of watts, in continuous-wave, short nanosecondQ-switched, or picosecond modelocked pulsed regimes. Its main advantages over other Nd-dopedhosts such as YAG are a large stimulated-emission cross section leading to a high gain, a strongpump absorption allowing the efficient mode-matching of tightly-focused pump light, and a naturalbirefringence resulting in a continuously polarized output. The main drawbacks, however,are rather poor mechanical characteristics and strong thermal lensing, effectively limiting themaximum applicable pump power before excessively strong and aberrated thermal lensing preventsan efficient operation in a diffraction-limited beam, and ultimately the crystal's fracture.Put aside the power limitation, the association of vanadate with diode end pumping allows forthe realization of highly efficient and reliable laser sources based on well-known technologies,which provides an advantage in terms of manufacturability and cost-effectiveness over otherhigh-potential technologies such as disks and fibers.This thesis introduces a novel pumping technique for Nd:YVO4 that allows for the realizationof significantly higher-power laser sources with a high optical-to-optical efficiency anddiffraction-limited beam quality, while keeping the benefits of a well-established technology. Itconsists in pumping at a wavelength of 888 nm instead of the classic 808 nm, providing a lowand isotropic absorption, which results in a smooth distribution of the absorbed pump light inlong crystals, effectively limiting the deleterious effects of high inversion density such as crystalend-facet bulging, high crystal temperature, aberrated thermal lensing, and upconversion. Afterpresenting vanadate's spectroscopic and physical characteristics, a complete analysis of the heatgeneratingeffects is performed, allowing for side-by-side simulations of the thermal effects inpractical 808 nm and 888 nm pumped systems, and for an evaluation of...

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