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Pump Module for High Average Power Diode-Pumped Solid-State Lasers High-Power Diode Lasers High Power Diode-pumped Solid-state Lasers High Average Power Diode Pumped Solid State Lasers for CALIOPE. High-power diode-pumped solid-state 2 micron lasers High-average-power, Diode-pumped Solid State Lasers for Energy and Industrial Applications High Power Diode Pumped Solid State Laser Development at Lawrence Livermore National Laboratory High Average Power Diode Pumped Solid State Lasers: Power Scaling With High Spectral and Spatial Coherence 2017 IEEE High Power Diode Lasers and Systems Conference (HPD) High-power diode-pumped fibre-laser Towards High Power Diode Pumped Femtosecond All-solid State Lasers High Power Diode Pumped Single Frequency Lasers High-average-power, Diode-pumped Solid State Lazers for Energy and Industrial Applications מבוא קוונטית Introduction to Laser Diode-pumped Solid State Lasers High-average-power Diode-pumped Yb 2015 IEEE High Power Diode Lasers and Systems Conference (HPD) High Power Diode Pumped Lasers and Systems, 2006. The Institution of Engineering and Technology Seminar on New Class of CW High-Power Diode-Pumped Alkali Lasers (DPALs). 2006 IET Seminar on High Power Diode Pumped Lasers and Systems High Power, Diode-pumped, Planar Waveguide Lasers with Excellent Beam Quality Thermal Lensing in a High Power Diode-pumped Continuous Wave Yb+3:KY(WO4)2 Laser 2013 High Power Diode Lasers and Systems Conference (HPD) Gigahertz Frequency Combs from High-power Diode-pumped Solid-state Lasers High power diode-pumped solid-state laser operation in the bounce amplifier geometry Diode Pumping of Average-power Solid State Lasers 2019 IEEE High Power Diode Lasers and Systems Conference (HPD) Proceedings of the 2015 High Power Diode Lasers and Systems Conference (HPD) High Power Diode Pumped Lasers and Systems, 2006. The Institution of Engineering and Technology Seminar on Conference Proceedings Pulsed Power System for the HAPLS Diode Pumped Laser System Epitaxial Design Optimizations for Increased Efficiency in GaAs-Based High Power Diode Lasers High-average-power Diode-end-pumped Intracavity-doubled Nd High Power Continuous Wave Nd:KGW Laser with Low Quantum Defect Diode Pumping Passive Q-switching of a Diode-pumped Neodymium: YAG Laser A High-power, Diode-laser-pumped, Solid-state Laser for Precision Interferometry Single frequency and high power operation of diode-pumped solid-state lasers Amplified Spontaneous Emission and Thermal Management on a High Average-Power Diode-Pumped Solid-State Laser - The Lucia Laser System Diode-pumped Nd:YLF lasers for high-power operation LEOS '90

High Power Diode-pumped Solid-state Lasers **Jun 23 2023**

High Power Diode Pumped Lasers and Systems, 2006. The Institution of Engineering and Technology Seminar on **Mar 28 2021**

2006 IET Seminar on High Power Diode Pumped Lasers and Systems **Jan 06 2022**

2015 IEEE High Power Diode Lasers and Systems Conference (HPD) Apr 09 2022

This conference is the premier annual event addressing the latest advances in diode and diode pumped laser technology and systems applications The conference covers laser pump diodes diode pumped solid state and fibre

lasers applications of diode laser technology in consumer products, processing, healthcare and biophotonics, defence and security

High-average-power, Diode-pumped Solid State Lasers for Energy and Industrial Applications Mar 20 2023 Progress at LLNL in the development high-average-power diode-pumped solid state lasers is summarized, including the development of enabling technologies.

Amplified Spontaneous Emission and Thermal Management on a High Average-Power Diode-Pumped Solid-State Laser - The Lucia Laser System Jun 18 2020

***Conference Proceedings* Feb 24 2021**

A High-power, Diode-laser-pumped, Solid-state Laser for Precision Interferometry Aug 21 2020

***Thermal Lensing in a High Power Diode-pumped Continuous Wave Yb+3:KY(WO4)2 Laser* Nov 04 2021**

High Power Diode Pumped Single Frequency Lasers Sep 14 2022

***Introduction to Laser Diode-pumped Solid State Lasers* Jun 11 2022 This text covers a wide range of material, from the basics of laser resonators to advanced topics in laser diode pumping. The subject matter is presented in descriptive terms that are understandable by the technical professional who does not have a strong foundation in fundamental laser topics.**

High-average-power Diode-pumped Yb May 10 2022 A scaleable diode end-pumping technology for high-average-power slab and rod lasers has been under development for the past several years at Lawrence Livermore National Laboratory (LLNL). This technology has particular application to high average power Yb:YAG lasers that utilize a rod configured gain element. Previously, this rod configured approach has achieved average output powers in a single 5 cm long by 2 mm diameter Yb:YAG rod of 430 W cw and 280 W q-switched. High beam quality (M2 = 2.4) q-switched operation has also been demonstrated at over 180 W of average output power. More recently, using a dual rod configuration consisting of two, 5 cm long by 2 mm diameter laser rods with birefringence compensation, we have achieved 1080 W of cw output with an M2 value of 13.5 at an optical-to-optical conversion efficiency of 27.5%. With the same dual rod laser operated in a q-switched mode, we have also demonstrated 532 W of average power with an M2

LEOS '90 Apr 16 2020

Proceedings of the 2015 High Power Diode Lasers and Systems Conference (HPD) Apr 28 2021

***Epitaxial Design Optimizations for Increased Efficiency in GaAs-Based High Power Diode Lasers* Dec 25 2020 This work presents progress in the root-cause analysis of power saturation mechanisms in continuous wave (CW) driven GaAs-based high-power broad area diode lasers operated at 935 nm. Target is to increase efficiency at high optical CW powers by epitaxial design. The novel extreme triple asymmetric (ETAS) design was developed and patented within this work to equip diode lasers that use an extremely thin p-waveguide with a high modal gain. An iterative variation of diode lasers employing ETAS designs was used to experimentally clarify the impact of modal gain on the temperature dependence of internal differential quantum efficiency (IDQE) and optical loss. High modal gain leads to increased free carrier absorption from the active region. However, less power saturation is observed, which must then be attributed to an improved temperature sensitivity of the IDQE. The effect of longitudinal spatial hole burning (LSHB) leads to above**

average non-linear carrier loss at the back facet of the device. At high CW currents the junction temperature rises. Therefore, not only the asymmetry of the carrier profile increases but also the average carrier density in order to compensate for the decreased material gain and increased threshold gain. This carrier non-pinning effect above threshold is found in this work to enhance the impact of LSHB already at low currents, leading to rapid degradation of IDQE with temperature. This finding puts LSHB into a new context for CW-driven devices as it emphasizes the importance of low carrier densities at threshold. The carrier density was effectively reduced by applying the novel ETAS design. This enabled diode lasers to be realized that show minimized degradation of IDQE with temperature and therefore improved performance in CW operation.

Gigahertz Frequency Combs from High-power Diode-pumped Solid-state Lasers **Sep 02 2021**

High-power diode-pumped solid-state 2 micron lasers Apr 21 2023

Diode Pumping of Average-power Solid State Lasers **Jun 30 2021**

Towards High Power Diode Pumped Femtosecond All-solid State Lasers Oct 15 2022

High Average Power Diode Pumped Solid State Lasers: Power Scaling With High Spectral and Spatial Coherence Jan 18 2023 The main program objective was the development of a kilowatt class, cw Nd:YAG diode-laser-pumped solid-state laser (DPSSL) with quantum noise limited amplitude and phase, 24by7 operation capability and the ability to be repaired while in operation. The approach was a master-oscillator power-amplifier (MOPA) laser utilizing a series of zig-zag slab power amplifiers stages. We developed fiber amplifiers at the 200W level to generate power with high optical efficiency that can effectively extract energy from the power amplifier slabs. We also worked on the generation of high average power visible light by developing nonlinear optical materials with large apertures, low photo-refraction and minimal visible induced infrared absorption. The second objective was to develop a 1 joule, pulse-modulated, diffraction limited MOPA laser with less than 1 MHz line-width. A follow-on objective was frequency conversion to 1.5 or 2.0 microns for remote sensing applications. We demonstrated Yb:YAG slab lasers pumped with high brightness laser diodes. Supporting this project was the development of laser diodes operating in the 1.5 micron region for pumping of erbium doped laser hosts, and the synthesis of new low-loss polycrystalline laser host materials for in-band pumping into the upper laser level to improve the laser efficiency at eye-safe wavelengths. We developed orientation patterned Ga-As to frequency convert high peak power 1-micron radiation to eye-safe wavelengths in the mid-infrared for defense applications. The third objective, power scaling and determining the potential for phase-locking of ultra-fast laser systems for a wide range of sensing and machining applications, was demonstrated as well.

High power diode-pumped solid-state laser operation in the bounce amplifier geometry **Aug 01 2021**

High-Power Diode Lasers Jul 24 2023 Starting from the basics of semiconductor lasers with emphasis on the generation of high optical output power the reader is introduced in a tutorial way to all key technologies required to fabricate high-power diode-laser sources. Various applications are exemplified.

2019 IEEE High Power Diode Lasers and Systems Conference (HPD) May 30 2021 This conference is the premier biannual event addressing the latest advances in diode and diode pumped laser technology and systems applications The conference covers laser pump diodes diode pumped solid state and fibre lasers applications of diode laser technology in consumer products, processing, healthcare and biophotonics, defence and security

Diode-pumped Nd:YLF lasers for high-power operation May 18 2020

קוראות מבראשית Jul 12 2022

High Power Diode Pumped Solid State Laser Development at Lawrence Livermore National Laboratory Feb 19 2023 The authors recent developments in high powered diode pumped solid state lasers at Lawrence Livermore National Laboratory. Over the past year the authors have made continued improvements to semiconductor pump array technology which includes the development of higher average power and lower cost pump modules. They report the performance of high power AlGaAs, InGaAs, and AlGaInP arrays. They also report on improvement to the integrated micro-optics designs in conjunction with lensing duct technology which gives rise to very high performance end pumping designs for solid state lasers which have major advantages which they detail. Substantial progress on beam quality improvements to near the diffraction limit at very high power have also been made and will be reported. They also will discuss recent experiments on high power non-linear materials for q-switches, harmonic converters, and parametric oscillators. Advances in diode pumped devices at LLNL which include tunable Cr:LiSrAlF6, mid-IR Er:YAG, holmium based lasers and other developments will also be outlined. Concepts for delivering up to 30 kilowatts of average power from a DPSSL oscillator will be described.

2013 High Power Diode Lasers and Systems Conference (HPD) Oct 03 2021 Advances in diode lasers continue unabated as the range of applications increases Advances in diode pump lasers have also contributed to advances in solid state and fiber lasers Topics will include Advances in diode pumped solid state lasers, Beam combining approaches, Developments in diode pumped fiber lasers, Industrial lasers for cutting welding, Laser diodes optimized for external cavity operation, Volume manufacturing of laser diode systems, High power diode laser applicatons

Passive Q-switching of a Diode-pumped Neodymium: YAG Laser Sep 21 2020

High-average-power Diode-end-pumped Intracavity-doubled Nd Nov 23 2020 A compact diode-pumped ND:YAG laser was frequency-doubled to 0.532?m with an intracavity KTP or LBO crystal using a V ` cavity configuration. Two acousto-optic Q-switches were employed at repetition rates of 10-30 kHz. Dichroic fold and end mirrors were used to output two beams with up to 140 W of 0.532?m power using KTP and 116 W using LBO as the frequency doubling crystal. This corresponds to 66% of the maximum output power at 1.064?m obtained with an optimized output coupler reflectivity. The minimum output pulse duration varied with repetition rate from 90 to 130 ns. The multimode output beam had a smooth profile and a beam quality of M2 = 5 1.

Pump Module for High Average Power Diode-Pumped Solid-State Lasers Aug 25 2023 The objective of this DURIP-99 University Research Instrumentation Program, F49620-99-1-0200 was to acquire laser diode pump modules to enable research on high average power, scalable DPSS lasers, nonlinear optical materials, and the continued education of Ph.D.students in this field.

Twelve 940 nm fiber-coupled 55 W laser diode units were purchased, along with six power supplies and a controller. This system is currently in use to pump a zigzag slab laser using Yb:YAG as the active medium. Numerical modeling predicts that Yb:YAG slab lasers can be scaled to the 100kW level. Twenty-four 808 nm fiber-coupled 30 W laser diode units were purchased, along with four power supplies, four temperature controller units and a controller. This system has been used to demonstrate phased array output from a zigzag Nd:YAG slab laser. This advance opens the engineering path toward scaling slab lasers to 100kW power levels.

Pulsed Power System for the HAPLS Diode Pumped Laser System Jan 26 2021

***2017 IEEE High Power Diode Lasers and Systems Conference (HPD)* Dec 17 2022 This conference is the premier annual event addressing the latest advances in diode and diode pumped laser technology and systems applications The conference covers laser pump diodes diode pumped solid state and fibre lasers applications of diode laser technology in consumer products, processing, healthcare and biophotonics, defense and security**

***High Power Continuous Wave Nd:KGW Laser with Low Quantum Defect Diode Pumping* Oct 23 2020 High power diode-pumped solid state (DPSS) lasers are a rapidly growing technology that is attractive for various applications in scientific and industrial fields. DPSS lasers are highly efficient, reliable and durable with superior beam quality when compared to flash-lamp pumped solid state lasers. Double-tungstate crystal of neodymium-doped potassium gadolinium tungstate (Nd:KGW) is one of the most effective active media used in DPSS lasers for generation of continuous wave radiation and ultrashort (i.e. picosecond, 10−12 s) pulses. Unfortunately, the thermal conductivity of KGW host crystals is relatively low (~3 Wm−1K−1). This low thermal conductivity and large quantum defect while pumping with ~808 nm lead to significant thermo-optical distortions. One way to minimize thermo-optical distortions is to reduce the quantum defect. This can be done by pumping at longer wavelengths as compared to conventional 808 nm. In this work we demonstrate what we believe is the first continuous wave Nd:KGW laser with hot band diode pumping at ~910 nm. This pumping wavelength reduced the quantum defect by >46% as compared to the conventional ~808 nm pumping and resulted in significantly lower thermal lensing. The laser produced 2.9 W of average output power at 1067 nm in a diffraction limited beam for an absorbed pump power of 8.3 W. The slope efficiency and optical-to-optical efficiency were found to be 43% and 35%, respectively. Significant reduction of quantum defect offered by this pumping wavelength and availability of suitable high power laser diodes opens an attractive way to further power and efficiency scaling of the Nd:KGW lasers.**

Single frequency and high power operation of diode-pumped solid-state lasers Jul 20 2020

High Power, Diode-pumped, Planar Waveguide Lasers with Excellent Beam Quality Dec 05 2021

***New Class of CW High-Power Diode-Pumped Alkali Lasers (DPALs).* Feb 07 2022 The new class of diode-pumped alkali vapor lasers (DPALs) offers high efficiency cw laser radiation at near-infrared wavelengths: cesium 895 nm, rubidium 795 nm, and potassium 770 nm. The working physical principles of DPALs will be presented. Initial 795 nm Rb and 895 nm Cs laser experiments performed using a titanium sapphire laser as a surrogate pump source**

demonstrated DPAL slope power conversion efficiencies in the 50-70% range, in excellent agreement with device models utilizing only literature spectroscopic and kinetic data. Using these benchmarked models for Rb and Cs, optimized DPALs with optical-optical efficiencies>60%, and electrical efficiencies of 25-30% are projected. DPAL device architectures for near-diffraction-limited power scaling into the high kilowatt power regime from a single aperture will be described. DPAL wavelengths of operation offer ideal matches to silicon and gallium arsenide based photovoltaic power conversion cells for efficient power beaming.

High Power Diode Pumped Lasers and Systems, 2006. The Institution of Engineering and Technology Seminar on Mar 08 2022

High-power diode-pumped fibre-laser Nov 16 2022

High-average-power, Diode-pumped Solid State Lazers for Energy and Industrial Applications Aug 13 2022

High Average Power Diode Pumped Solid State Lasers for CALIOPE. May 22 2023

Diode pumping of solid state media offers the opportunity for very low maintenance, high efficiency, and compact laser systems. For remote sensing, such lasers may be used to pump tunable non-linear sources, or if tunable themselves, act directly or through harmonic crystals as the probe. The needs of long range remote sensing missions require laser performance in the several watts to kilowatts range. At these power performance levels, more advanced thermal management technologies are required for the diode pumps. The solid state laser design must now address a variety of issues arising from the thermal loads, including fracture limits, induced lensing and aberrations, induced birefringence, and laser cavity optical component performance degradation with average power loading. In order to highlight the design trade-offs involved in addressing the above issues, a variety of existing average power laser systems are briefly described. Included are two systems based on Spectra Diode Laboratory's water impingement cooled diode packages: a two times diffraction limited, 200 watt average power, 200 Hz multi-rod laser/amplifier by Fibertek, and TRW's 100 watt, 100 Hz, phase conjugated amplifier. The authors also present two laser systems built at Lawrence Livermore National Laboratory (LLNL) based on their more aggressive diode bar cooling package, which uses microchannel cooler technology capable of 100% duty factor operation. They then present the design of LLNL's first generation OPO pump laser for remote sensing. This system is specified to run at 100 Hz, 20 nsec pulses each with 300 mJ, less than two times diffraction limited, and with a stable single longitudinal mode. The performance of the first testbed version will be presented. The authors conclude with directions their group is pursuing to advance average power lasers. This includes average power electro-optics, low heat load lasing media, and heat capacity lasers.