Title:	Towards the development of a femtosecond laser and thermal simulation of all-solid-state high power diode lasers J
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Abstract:	Pulsed lasers differ from continuous lasers in several ways. A femtosecond laser has a pulse duration in the range of 10 −15 seconds and can achieve peak power of up to some GW for mJ energy pulses. When they focused on materials, non-linear dy- namics properties could be seen inside the material because of their high intensity. In the second chapter of this thesis, we aimed to develop a Ti: Sapphire femtosec- ond laser from scratch. Towards that we developed an all-solid-state, highly power stable, and temperature-controlled green cw diode pump laser with up to 10W out- put power for our Ti: Sapphire Femtosecond Laser until submission with a size of 15 × 15 × 5 cm. The equilibrium temperature of this laser at 2 W output power was recorded at 14 o C, and for 8 W output power, it was 45 o C. Next, we collimated the beam and successfully focused this pump laser into a 200 × 500 micron area of Ti: Sapphire crystal. We demonstrated that our pump laser produces fluorescence emission from Ti: Sapphire crystal from 600 nm to 750 nm. Motivated by the recent demonstration of successful optical pumping of a Ti: Sapphire crystal with blue diode lasers, we theoretically proposed an all-solid-state thermal management system for a high power blue laser operating at 100W contin- uous wave output. In the Third chapter of this thesis we modeled an all-solid-state high power blue laser system that can operate up to 100W output power in Comsol multiphysics 5.3 software. We used the thermoelectric effect to extract Heat from laser diodes. We used four 75 W power Thermoelectric coolers(TECs) to transfer a maximum of 300W Heat from laser diodes to the surroundings. We believe that this work will lead to high power visible and femtosecond laser system for intriguing applications.
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