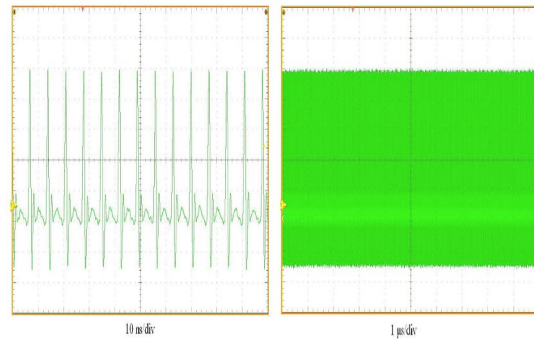


Fiber and Laser Optics

Diode pumped ultrashort pulse solid-state lasers – Assoc. Prof. Tang Dingyuan (E-mail: edytang@ntu.edu.sg)

Our research on the diode-pumped solid state lasers has been focused on the development of new types of solid-state lasers and the high power mode locked lasers. In collaboration with scientists of National Crystal Research Institute, Shandong University, China, we have developed a novel type of dual-wavelength synchronously mode-locked Nd:CNGG laser. Based on the semiconductor saturable absorber (SESAM) mode-locking technique, we could simultaneously mode-lock two gain bands of the Nd:CNGG crystal that has a central wavelength separation of 2.4nm, and synchronize the mode locked pulses. The fundamental mode-locked pulse train of the laser has a repetition rate of 88MHz and a pulse width of 5ps. However, as a result of the synchronous mode-locking of the two gain bands, each of the fundamental mode-locked pulse further consists of a train of pulses with pulse width of 660 fs and a repetition rate of 0.63 THz. The dual-wavelength synchronous mode-locking technique opens up a new way of generating THz radiation from lasers.

Using SESAM mode-locking technique, we had also demonstrated high average power mode-locking of a diode-pumped Nd:YAG ceramic laser with an average output power of 5.5 W and a mode locked pulse width of 35 ps, and a diode pumped Nd:LuVO₄ single crystal laser, with an average output power of 8.3 W and a pulse width of 20 ps.



Oscilloscope traces of the mode-locked Nd:YAG ceramic laser pulse trains. Pulse width ~ 35 ps, pulse energy ~ 16nJ, pulse peak power ~ 0.45 kW.