High Intensity Mega Hertz Mode-Locked Laser

Advantages

- Stable, cost-effective and easy to manufacture mode-locked lasers, which are compact and use lower optical elements.
- High repetition rate MHz mode-locked lasers allow for precise determination of the repetition rate, which is required for synchronization applications.
- Mode-locked ultrafast laser with a cavity-dumping feature, keeps the optical losses of the laser resonator as low as possible, resulting in an highly efficient laser.
- Low cost, high peak power, ultrafast megahertz (MHz) mode-locked laser of increased ruggedness.

Invention

Systems, devices and methods of using stable, self-starting mode-locked lasers, which are compact, use lower optical elements and have energies sufficient for most microprocessing and micro-structuring applications.

Background

Extremely short duration optical pulses, which are known as femtosecond pulses, are ultra-short pulses that make it possible to investigate ultrafast processes, and can be used for fast optical data transmission. Ultra-short pulses have unique advantages in that extremely high energies can be created over ultra-short time scales. These high energies allow access to unique physical processes that only occur at these energies. Mode-locked lasers are lasers that can be made to produce pulses of light of extremely short duration (femtoseconds). These lasers are crucial for high speed signal processing, communications, micro and nano-machining, imaging, and sensing applications. There is a need therefore, for the development of low cost, compact, and high intensity megahertz (MHz) mode-locked lasers. Current conventional, commercial, ultrafast mode-locked lasers have basic constituents, which include an active laser medium, resonator mirror, and optical components, usually prisms that compensate for dispersion in the resonator. However, these systems are complex, cost-ineffective, unstable, and require high pump power levels.

The present invention introduces a novel and unique laser system that uses stable, self-starting mode-locked lasers, which are compact and use lower optical elements to produce ultra-short light pulses with sufficient energy for micro and nano-machining applications. The femtosecond regime of the ultra-short light pulses minimizes heat deposition and allows the fabrication of fine features (<10 microns). This novel, compact and commercially viable femtosecond pulses technology will enable a wider range of ultrafast laser applications, making it more available to both the research and the development communities.

Application

This novel invention can directly applied to high speed signal processing, communications, micro and nano-machining, imaging, sensing, microprocessing and micro-structuring.

Lead Inventor
M. Richardson, Ph.D.

Contact: John Miner; University of Central Florida; Office of Research and Commercialization, 12201 Research Parkway, Suite 202, Orlando, FL 32826-3246
Phone: (407) 822-1136; Fax: (407) 882-9010; jminer@mail.ucf.edu; UCF IP #30269