Most Powerful Laser to Date Produced; Technology Could Revolutionize Cancer Treatment

June 26 2004

University of Michigan researchers recently produced what is believed to be the highest-intensity laser pulse ever obtained.
The U-M-built laser, called High Energy Repetitive CUos Laser System (HERCULES), is so compact and intense that it could revolutionize the way cancer is treated, researchers say.

The ultra-fast laser pulse generated by HERCULES is 50 times more powerful than all the world's power plants combined, said Gerard Mourou, professor and director of the Center for Ultrafast Optical Science in the Department of Electrical Engineering and Computer Science.

Besides basic research, an important practical application for the laser is ion therapy used to treat cancer patients. Ion therapy is successful, but the particle accelerators used for the treatment are so big and expensive---because they must generate huge amounts of power---that they render the treatment unavailable to the public.

This new type of laser-based accelerator relies on the increased speed of the particle by the enormous electric field of the laser accelerator, which is one million times larger than conventional ones. U-M's laser can be used in compact particle accelerators, which would make the ion therapy more affordable and accessible. Now, only a handful of locations worldwide offer the ion therapy, said Victor Yanovsky, assistant

research scientist who designed the HERCULES laser.

Ion therapy is the preferred method to treat cancer because it causes minimal collateral damage to neighboring tissues unlike say, radiation therapy, which damages healthy as well as diseased areas.

The powerful, compact lasers use short pulses. The laser pulse developed at U-M lasts only 30 femtoseconds, the time it takes for light to travel the distance of a blood cell. The pulse was focused on an area 1 1/100th of the width of a hair. U-M researchers announced the development at the 2004 Lasers and Electro-Optics/International Quantum Electronics Conference in San Francisco in late May.

For more information, visit: www.eecs.umich.edu/CUOS/

Source: University of Michigan