Researchers build world's first mode-locked silicon evanescent laser

August 21 2007

Researchers at UC Santa Barbara have announced they have built the world's first mode-locked silicon evanescent laser, a significant step toward combining lasers and other key optical components with the existing electronic capabilities in silicon.

The research provides a way to integrate optical and electronic functions on a single chip and enables new types of integrated circuits. It introduces a more practical technology with lower cost, lower power consumption and more compact devices. The research will be reported in the September 3 issue of *Optics Express* and is published online today.

Mode-locked evanescent lasers can deliver stable short pulses of laser light that are useful for many potential optical applications, including high-speed data transmission, multiple wavelength generation, remote sensing (LIDAR) and highly accurate optical clocks.

Computer technology now depends mainly on silicon electronics for data transmission. By causing silicon to emit light and exhibit other potentially useful optical properties, integration of photonic devices on silicon becomes possible. The problem in the past" It is extremely difficult, nearly impossible, to create a laser in silicon.

Less than one year ago, a research team at UCSB and Intel, led by John Bowers, a professor of electrical and computer engineering, created laser light from electrical current on silicon by placing a layer of InP above the silicon. In this new study, Bowers, Brian Koch, a doctoral student,

and others have used this platform to demonstrate electrically-pumped lasers emitting 40 billion pulses of light per second.

This is the first ever achievement of such a rate in silicon and one that matches the rates produced by other mediums in standard use today. These short pulses are composed of many evenly spaced colors of laser light, which could be separated and each used to transmit different high-speed information, replacing the need for hundreds of lasers with just one.

Creating optical components in silicon will lead to optoelectronic devices that can increase the amount and speed of data transmission in computer chips while using existing silicon technology. Employing existing silicon technology would represent a potentially less expensive and more feasible way to mass-produce future-generation devices that would use both electrons and photons to process information, rather than just electrons as has been the case in the past.

Source: University of California - Santa Barbara