

Optical computer made from frozen light

Scientists learn to process information with 'frozen light'

Scientists at Harvard University have shown how ultra-cold atoms can be used to freeze and control light to form the "core" – or central processing unit – of an optical computer. Optical computers would transport information ten times faster than traditional electronic devices, smashing the intrinsic speed limit of silicon technology.

This new research could be a major breakthrough in the quest to create super-fast computers that use light instead of electrons to process information. Professor Lene Hau is one of the world's foremost authorities on "slow light". Her research group became famous for slowing down light, which normally travels at 186,000 miles per second, to less than the speed of a bicycle.

Using the same apparatus, which contains a cloud of ultra-cold sodium atoms, they have even managed to freeze light altogether. Professor Hau says this could have applications in memory storage for a future generation of optical computers.

But Professor Hau's most recent research addresses the issue of optical computers head-on. She has calculated that ultra-cold atoms known as Bose-Einstein condensates (BECs) can be used to perform "controlled coherent processing" with light. In ordinary matter, the amplitude and phase of a light pulse would be smeared out, and any information content would be destroyed. Hau's work on slow light, however, has proved experimentally that these attributes can be preserved in a BEC. Such a device might one day become the CPU of an optical computer.

Traditional electronic computers are advancing ever closer to their theoretical limits for size and speed. Some scientists believe that optical computing will one day unleash a new revolution in smaller and faster computers.

Professor Lene Hau is Gordon McKay Professor of Applied Physics & Professor of Physics at Harvard University.

Website: <http://www.deas.harvard.edu/haulab/>

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