Using photons to manage data

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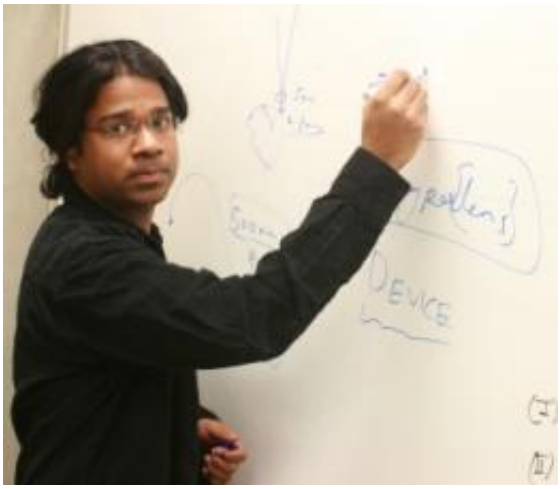

U of A engineering professor Zubin Jacob wants to refine the optical transmission of information by using a single photon, to allow unprecedented applications in optical information transfer.

Managing light to carry computer data, such as text, audio and video, is possible today with laser light beams that are guided along a fibre-optic cable. These waves consist of countless billions of photons, which carry information down the fibre across continents.

A research team at the University of Alberta wants to refine the optical transmission of information by using a single photon, the fundamental building block of light that can allow unprecedented applications in optical information transfer.

Zubin Jacob, a U of A electrical and computer engineering researcher, says that rather than spreading data over waves of light, the goal is to use single particles of light, photons.

“Unfortunately, the efficient generation of single photons for practical applications is a serious engineering challenge,” said Jacob.

Jacob and his research team are looking into metamaterials to tackle this problem. A metamaterial is a medium that has designer nanostructures in it, giving it technical capabilities beyond any materials we currently have. “The metamaterial would efficiently collect single photons of light and allow their transmission,” said Jacob.

At other universities, researchers are looking at attaching single photons to waves of electrons. The electrons and photons combine to form a plasmon wave that can be transmitted on a metal nanowire.

Jacob says the benefit of working with single photons for transmitting computer data is the ability to encode much more complex information on an individual particle of light. “A single photon could carry encryption codes, which are far more complex than the security password information we currently use to protect sensitive data.”

Jacob says that this technology is at least 10 years away and the products are not aimed at general consumers. “This technology is destined for markets such as the military that requires extremely high levels of data encryption.”

The development in this field of research combining nanophotonics and quantum technologies was published Oct. 27 in the journal Science.

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