New way of retaining quantum memories stored in light

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A team of Chinese physicists has now developed a way to confine light. This is significant because the approach allows quantum memories stored within photons to be retained. These findings stem from a study by Nan Sun from Nanjing University of Posts & Telecommunications, China, and colleagues, which has just been published in *EPJ D*. The results may herald the advent of a multitude of hybrid, optoelectronic devices relying on the use of quantum information stored in photons for processing information that can be used in communication networks or quantum computing.

Indeed, stopping and storing light for a duration ranging from a few

seconds to a few minutes is key for quantum information processing. Unfortunately, certain media induce a loss of coherence of the light, due to effects of the surroundings, which, in turn, affects the integrity of the quantum information stored in photons. This new study focuses on understanding the propagation properties of the electromagnetic wave associated with light to learn how best to stop it.

Previous attempts at stopping light by Georg Heinze and colleagues from Technische Universität Darmstadt, Germany, showed it was possible to stop light for an entire minute. They dramatically slowed down light's progression via interaction within its propagation medium. In contrast, the authors here rely on electric and magnetic polarisation to predict the conditions under which light could be confined. The authors' theoretical approach is based on controlling the speed at which the light's energy flows in order to stop it. At the same time, they also predict what it takes in terms of energy density to reach a stage where the electromagnetic waves constitutive of light can be stored, particularly in a medium in which waves travel at different speeds or are absorbed.

More information: N. Sun, J. Chen, D. Tang (2015), Stopping light in an active medium, *Eur. Phys. J. D* 69, 219, DOI: 10.1140/epjd/e2015-60320-4

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