Physicists create new, simpler-than-ever quantum 'hard drive for light'

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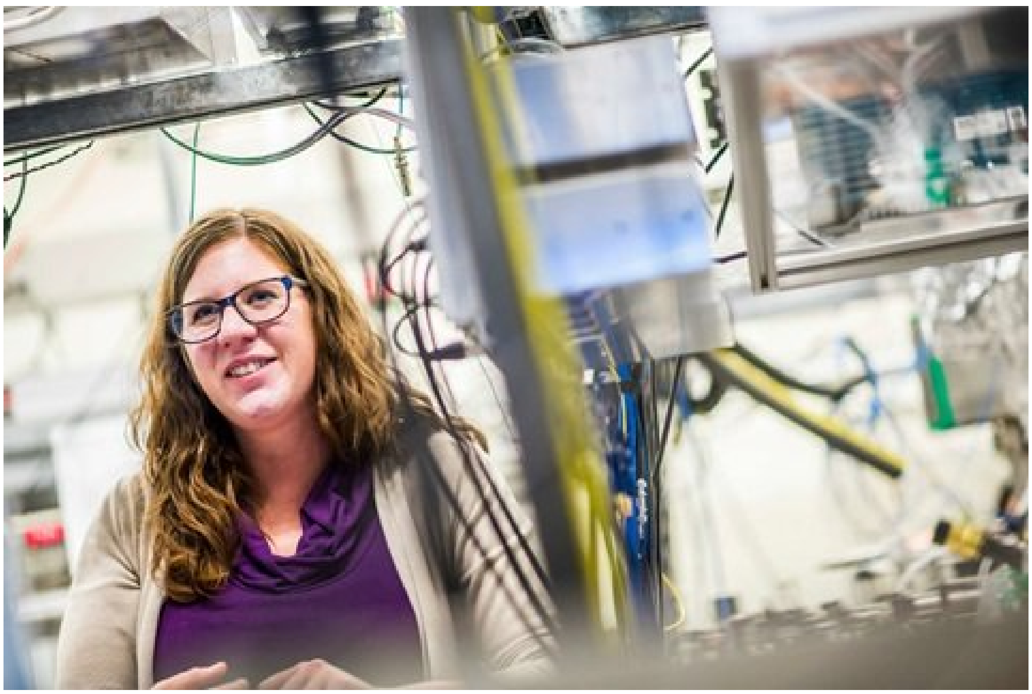

Lindsay LeBlanc, assistant professor of physics and Canada Research Chair in Ultracold Gases for Quantum Simulation. Leblanc, along with colleague Erhan Saglamyurek, have created a simpler-than-ever quantum "hard drive for light.". Credit: University of Alberta

Physicists at the University of Alberta in Canada have developed a new way to build quantum memories, a method for storing delicate quantum information encoded into pulses of light.

"We've developed a new way to store pulses of light—down to the single-photon level—in clouds of ultracold rubidium atoms, and to later retrieve them, on-demand, by shining a 'control' pulse of light," said Lindsay LeBlanc, assistant professor of physics and Canada Research Chair in Ultracold Gases for Quantum Simulation. LeBlanc conducted this research with postdoctoral fellow Erhan Saglamyurek.

Quantum memories are an important component of quantum networks, serving much the same role as hard drives in today's computers. And the interest in storing quantum data efficiently and effectively is only growing, with practical applications including a quantum fibre-optic internet and other methods of secure communication.

"This experiment involved taking short pulses of light, in which we could encode quantum information, storing the light in the atoms, and then retrieving the original pulse that carries the same information," explained Saglamyurek.

The novel method developed by LeBlanc and Saglamyurek, which is best-suited for key applications requiring high-speed operation, also has considerably fewer technical requirements than required in common quantum storage techniques. "The amount of power needed, for example, is significantly lower than current options, and these reduced requirements make it easier to implement in other labs," added Saglamyurek. This discovery will allow for the crucial scaling up of quantum technologies, which has proven the biggest challenge to date in the emerging field.

The research team also included two graduate students working in LeBlanc's lab, Taras Hrushevskyi and Anindya Rastogi, and Khabat Heshami from the National Research Council in Ottawa. The paper, "Coherent storage and manipulation of broadband photons via dynamically controlled Autler-Townes splitting," was published in

Nature Photonics.

More information: Erhan Saglamyurek et al, Coherent storage and manipulation of broadband photons via dynamically controlled Autler–Townes splitting, *Nature Photonics* (2018). DOI: 10.1038/s41566-018-0279-0

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