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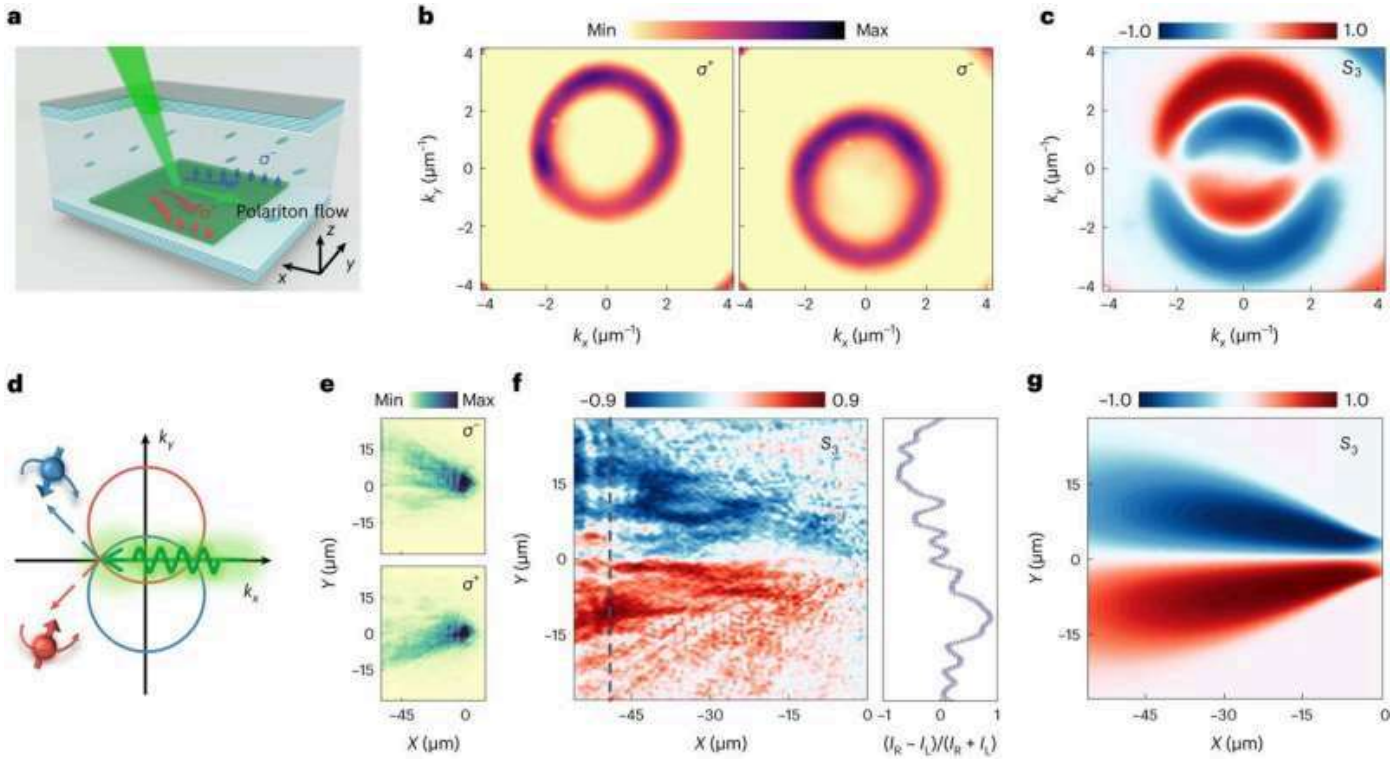
Editors' notes

Controlling polaritons at room temperature paves the way for high-speed computing

by Nanyang Technological University



Observation of the polariton spin Hall effect in the Rashba–Dresselhaus regime. Credit: *Nature Photonics* (2024). DOI: 10.1038/s41566-023-01375-x

Researchers have found a way to manipulate special hybrid particles called polaritons—which behave like both light and matter—at room temperature. The breakthrough enables the use of polaritons in high-speed computing and data processing.

Polaritons have a property called "spin," which can move clockwise or anti-clockwise on an axis. How polaritons spin allows them to encode computer data. Changing how they spin and move thus modifies the data stored in polaritons.

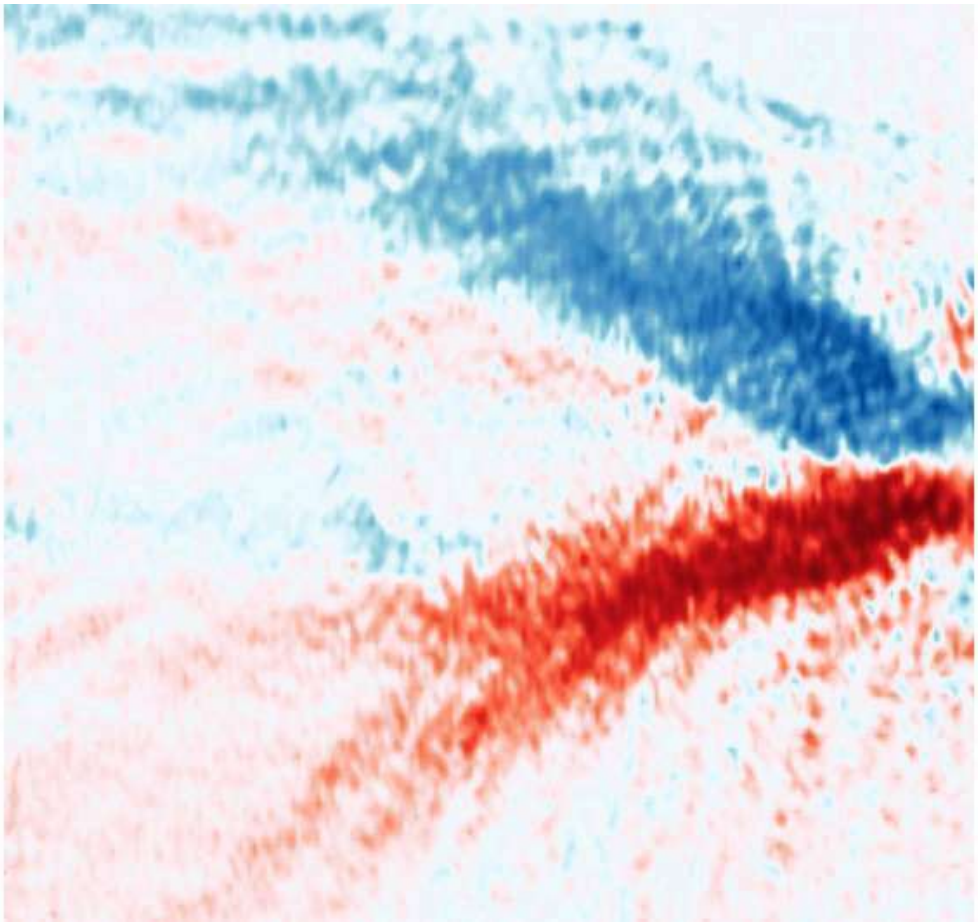
But such changes to polaritons have only been possible at ultra-low temperatures close to the coldness of outer space, making them expensive and impractical to maintain.

Now, a study co-led by Nanyang Assistant Professor Su Rui from Nanyang Technological University, Singapore's School of Physical and Mathematical Sciences (SPMS) and School of

Electrical and Electronic Engineering, along with Associate Professor Timothy Liew from SPMS, has shown that polaritons could be manipulated at room temperature when they are created.

The work is published in the journal *Nature Photonics*.

The particles are generated by shining a green laser on a material called cesium lead bromide with a layer of liquid crystal molecules in a microcavity structure.



An electric field applied to a microcavity structure caused polaritons with different spins to move away from one another in opposite directions. This is visualized here by a spectrometer, with red polaritons spinning in one way separated from blue polaritons spinning the other way after they moved apart. Credit: Nanyang Technological University, Singapore

The researchers controlled and changed the movements of the polaritons based on how they spin by applying an external voltage.

This method of manipulation allows the polaritons to store, transfer or process data at faster rates than current computing technologies because polaritons travel at the speed of light.

More information: Jie Liang et al, Polariton spin Hall effect in a Rashba–Dresselhaus regime at room temperature, *Nature Photonics* (2024). DOI: 10.1038/s41566-023-01375-x

Journal information: Nature Photonics