Researchers stop and store light for 60 seconds

A team of researchers at Germany's University of Darmstadt has succeeded in causing light to stop and then to be held in place for 60 seconds. In their paper published in the journal *Physical Review Letters*, the researchers describe how they achieved this feat and how their technique might be used in possible future applications.

In 1999 a team of researchers was able to slow light to just 17 meters per second. That led to another team devising a means for stopping its travel altogether in 2001, albeit for just a fraction of a second. Another team was able to increase that time to 16 seconds just a few months ago. In this new effort, the team in Germany has increased that time to a full minute.

Stopping light and holding it in place, then releasing it is an important step towards the creation of a quantum repeater, a necessary component of a future quantum computer. Light carrying data must be held for a time then retransmitted to a destination based on data it's carrying.

To stop light and hold it the researchers started with a crystal that doesn't normally transmit light at all. They cooled it to a very low temperature then fired a **laser** at it to cause a **quantum superposition** of two states, making it transparent for a precise range of frequencies. Next, they fired another laser through the now transparent crystal while turning off its transparency, trapping the light from the laser inside. They found they were able to hold the light in place for up to 60 seconds. Using the same technique the team found they were able to hold a pattern of light (three stripes) in place for the same amount of time. An analogy might be shining a flashlight into a dark room through a door, then shutting the door, waiting for a minute than opening a door on the other side of the room to let the light out. For light to be held, it has to be stopped, and that's what the team did with their crystal and lasers.

The researchers report that their findings suggest longer light-holding times should be attainable using other crystals. In order to apply their technique in a real-world computer, however, a way will have to be found to allow for holding then transmitting **light** at room temperature.

More information: *Physical Review Letters* **DOI: 10.1103/PhysRevLett.111.033601**