Portable Precision: A New Type of Atomic Clock

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The most accurate atomic clocks in the world are based on the output of cesium atoms. These ultra-precise fountain clocks measure the frequency and time interval of seconds by using a fountain-like movement of cesium atoms. Unfortunately, fountain clocks aren't easily transportable- they tend to be huge, stationary apparatuses stuck in laboratories.

Physicists from the University of New South Wales, Australia and the University of Nevada, Reno propose a method to reduce the size of atomic clocks to handy, compact devices using specially engineered optical lattices.

Optical lattices are created by trapping atoms in a standing wave light field formed by laser beams. But the lasers can hamper the time keeping ability of the atoms. By applying an external magnetic field to the lattice in a specific direction, the atomic clock is rendered insensitive to the laser field strength. This property allows the atomic clock to function properly at a smaller size.

While a portable cesium clock could benefit numerous scientific and general applications, the expected accuracy of the optical lattice clocks has yet to be explored. Calling for further theoretical and experimental investigation, the authors assert that even if the precision of such clocks turns out to be less competitive than the fountains, the optical lattice clocks have a clear advantage of a smaller apparatus size, making them useful in applications like navigation systems and precision tests of

fundamental symmetries in space.

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