Researchers demonstrate Heisenberg uncertainty principle at macro level

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(Phys.org)—Physicists working at the University of Colorado have succeeded in demonstrating one of the major tenets of quantum mechanics—namely the Heisenberg uncertainty principle—at the macro level. In their paper published in the journal *Science*, the team describes how a small but still visible drum they built in their lab, outfitted with mirrors, a laser and a detector, demonstrated that it was not possible to measure a photon's position and momentum simultaneously.

It was Heisenberg who famously noted that it was impossible to measure the momentum of an object and its position at the same time. As an example, he pointed out that using a microscope to look at a single electron, would require shining light on it. Those photons would cause the electron to move slightly, changing its momentum. Up till now, researchers testing or demonstrating this principle have worked at the micro level because attempting to do so with objects large enough to be seen with the naked eye seemed impossible due to the many variables at play. In this new research, the team in Colorado showed that this not necessarily the case.

They started by building a square drum frame out of silicon, with each side 0.5 millimeters long. They then stretched a thin film of silicon nitride over the skin to create the drum head. The drum was placed in a vacuum between two very tiny mirrors and was chilled to just 4 degrees above absolute zero to eliminate extraneous noise. The experiment was conducted by shooting a laser at the drum and measuring how much the head was distended by the photons striking it as they were bounced back and forth between the mirrors. As more photons struck the drum, greater fluctuations occurred in the measurements recorded, distorting the readings, and proving that the Heisenberg uncertainty principle can indeed be demonstrated with objects large enough to be seen with the naked eye.

The results of the experiment could also have an impact elsewhere, as researchers in Washington and Louisiana are planning a similar experiment over a much more vast scale—they will be seeking to measure gravitationally waves, which the theory of relatively says, should cause a change in distance between two objects. Their experiment will involve the use mirrors as well, but instead of a small drum, they will be trying to measure what happens when two black holes merge.

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