



Portable quantum-state estimation tool devised

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In quantum mechanics, a photon behaves both like a particle and a wave. The state of a quantum system (such as a photon) carries both its wave and particle information.

Physicists have now devised a novel technique to characterise and estimate the state of such a quantum system¹. This technique, they say, could potentially be used in quantum computing, communication and metrology.

Scientists led by Urbasi Sinha and Arun Kumar Pati, from the Raman Research Institute in Bengaluru and the Harish-Chandra Research Institute in Allahabad, both in India, designed a simple, single-shot experiment in which they sent a specific laser light, beam of photons, through a set-up that contains a suitably made interferometer.

The photons interact with one another, creating an interference pattern that is observed by placing detectors on a screen. Even after being absorbed by the detector, the photons left their trace.

This allowed the scientists to recover complete information about the quantum states, such as the identity of the photons.

This technique, which they call Quantum State Interferography (QSI), requires no change in any internal settings. It is scalable, with the potential for fabricating

miniaturised devices. For instance, a miniaturised QSI box could be made with interferometers inside it.

Such a box, the researchers say, could easily measure a quantum state. “This will be extremely beneficial as a portable, quantum-state estimation tool, something we have not seen before,” Sinha says.

References

1. Sahoo, S. N. *et al.* Quantum State Interferography. *Phys. Rev. Lett.* 125, 123601 (2020)