

Can we detect quantum behaviour in viruses?

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(PhysOrg.com) -- The weird world of quantum mechanics describes the strange, often contradictory, behaviour of small inanimate objects such as atoms. Researchers have now started looking for ways to detect quantum properties in more complex and larger entities, possibly even living organisms.

A German-Spanish research group, split between the Max Planck Institute for [Quantum Optics](#) in Garching and the Institute of Photonic Sciences (ICFO), is using the principles of an iconic quantum mechanics thought experiment - Schrödinger's superpositioned cat - to test for quantum properties in objects composed of as many as one billion atoms, possibly including the [flu virus](#).

New research published today, Thursday 11 March, in [New Journal of Physics](#), describes the construction of an experiment to test for superposition states in these larger objects.

Quantum optics is a field well-rehearsed in the process of detecting [quantum properties](#) in single atoms and some small molecules but the scale that these researchers wish to work at is unprecedented.

When physicists try to fathom exactly how the tiniest constituents of matter and energy behave, confusing patterns of their ability to do two things at once (referred to as being in a superposition state), and of their 'spooky' connection (referred to as [entanglement](#)) to their physically distant sub-atomic brethren, emerge.

It is the ability of these tiny objects to do two things at once that Oriol Romero-Isart and his co-workers are preparing to probe.

With this new technique, the researchers suggest that viruses are one type of object that could be probed. Albeit speculatively, the researchers hope that their technique might offer a route to experimentally address questions such as the role of life and consciousness in quantum mechanics.

In order to test for superposition states, the experiment involves finely tuning lasers to capture larger objects such as viruses in an ‘optical cavity’ (a very tiny space), another laser to slow the object down (and put it into what quantum mechanics call a ‘ground state’) and then adding a photon (the basic element of light) in a specific quantum state to the laser to provoke it into a superposition.

The researchers say, "We hope that this system, apart from providing new quantum technology, will allow us to test [quantum mechanics](#) at larger scales, by preparing macroscopic superpositions of objects at the nano and micro scale. This could then enable us to use more complex microorganisms, and thus test the quantum superposition principle with living organisms by performing quantum optics experiments with them."

More information: The published version of the paper "Towards quantum superpositions of living organisms" (Oriol Romero-Isart et al. *New Journal of Physics* 12 (2010) 033015) will be freely available online from Thursday 11 March. It will be available at iopscience.iop.org/1367-2630/12/3/033015

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