

The Light of Silence

Scientists have found a way of protecting quantum systems against noise using adaptively ‘shaped’ pulses of laser light. Quantum systems are notoriously fragile as interactions with their surroundings disturb them – rather like an orchestra trying to stay in tune in a very noisy environment. The stability of quantum systems is essential for any engineering at the quantum level.

Now researchers from Ian Walmsley’s Ultrafast Group at Oxford University’s Department of Physics have found a way to prolong the life of a model quantum system.

The advance uses a genetic algorithm to search for a light pulse containing a colour spectrum - ‘shaped’ in phase and amplitude – that when imprinted on a system protects it from decay. Contrary to what might be expected, the encoded order makes it more robust against disorder.

Matthijs Branderhorst, who did the experiment, explained: ‘There have been control techniques before to improve stability but they rely on knowing everything about a given system. The ground-breaking nature of our approach is that, knowing nothing about a system, we can automatically search for and apply a light pulse that makes it more robust. We have shown an improvement of the stability with our experimental test system, but on other cases it could make it completely immune from decay.’

The model system used by the researchers to study the idea consisted of two potassium atoms bound together. However, the approach they have developed could be applied to many other kinds of quantum systems such as those influencing chemical reactions, photosynthesis and quantum computation.

A report of the research, entitled ‘Coherent control of decoherence’, appears in this week’s *Science*.

Source: University of Oxford

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