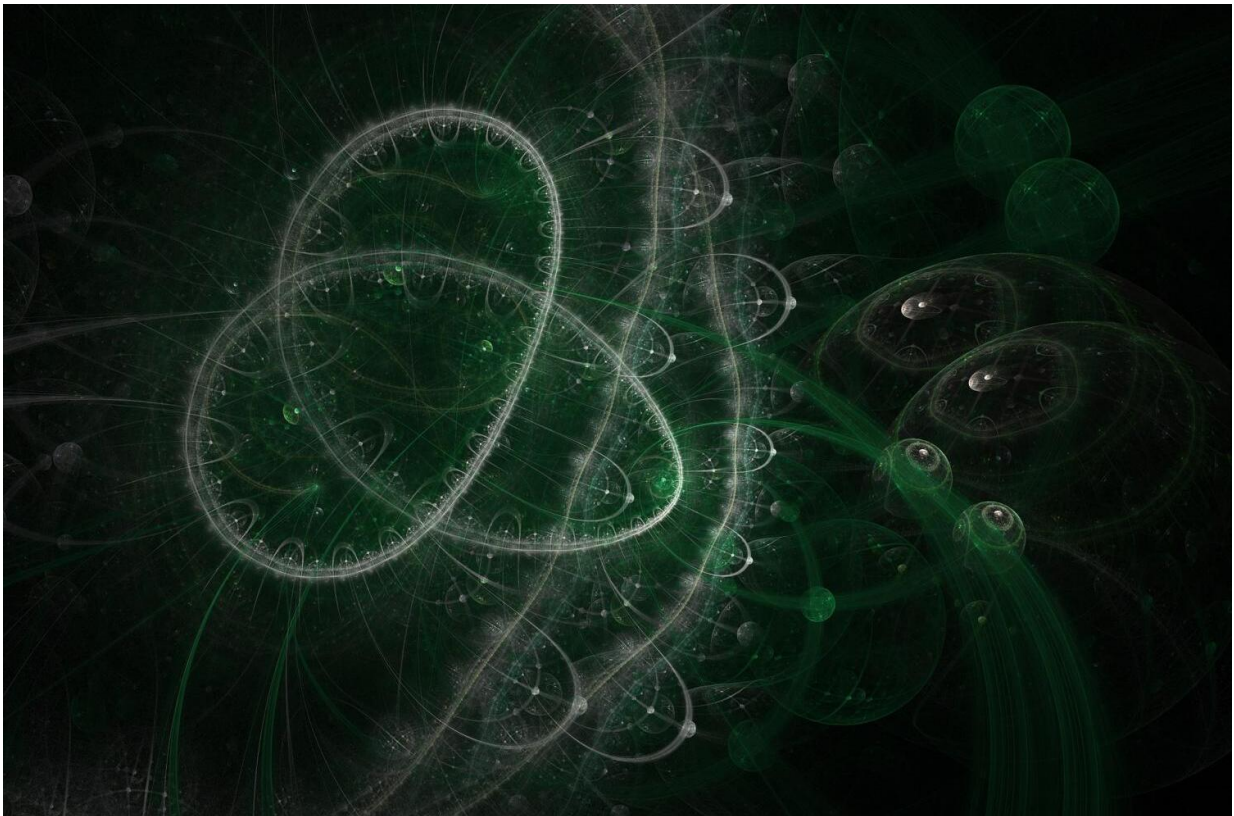


Researchers refine method for detecting quantum entanglement

June 17 2016, by David Glanz



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RMIT quantum computing researchers have developed and demonstrated a method capable of efficiently detecting high-dimensional entanglement.

Entanglement in [quantum physics](#) is the ability of two or more particles to be related to each other in ways which are beyond what is possible in classical physics.

Having information on a particle in an entangled ensemble reveals an "unnatural" amount of information on the other particles.

The researchers' paper, "High-dimensional [entanglement](#) certification", is being published on Friday 17 June in *Scientific Reports*.

Dr Alberto Peruzzo, a senior research fellow with RMIT University's School of Engineering and Director of RMIT's Quantum Photonics Laboratory, said: "The method we developed employs only two local measurements of complementary properties. This procedure can also certify whether the system is maximally entangled."

Full-scale [quantum computing](#) relies heavily on entanglement between the individual particles used to store information, the [quantum](#) bits, or qubits.

Quantum computing promises to exponentially speed up certain tasks because entanglement allows a vastly increased amount of information to be stored and processed with the same number of qubits.

Peruzzo said: "Together with this increase also comes the problem of needing to measure the device many times to find out what it is truly doing - that is, before the quantum computer is up and running, we need to gather an exponentially large amount of information on how it is performing."

Zixin Huang, a PhD student working on the experiment, said: "The current form of computer encodes information in binary form. A higher dimensional state, however, is a particle that contains a message that can

be 0, 1, 2 or more, so much more [information](#) can be stored and transmitted.

"To date, tools for characterising high-dimensional entangled states are limited. In the future when quantum computers become available, our method can potentially serve as a tool in certifying whether the system has enough entanglement between the qubits.

"It significantly cuts down on the number of measurements needed - in fact, it needs the least number of measurements per dimension. Additionally, unlike some others, this method works for systems of any dimension."

More information: *Scientific Reports*, [DOI: 10.1038/srep27637](https://doi.org/10.1038/srep27637) ,
Preprint: arxiv.org/abs/1604.05824

Provided by RMIT University

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