

Shining light in quantum computing

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University of Queensland scientist Devon Biggerstaff is investigating ways to manipulate light in a process that will help shape future supercomputers and communication technology.

Future supercomputers called quantum computers, which will surpass conventional desktop machines in some processing tasks, could encode information as photons or minute particles of light.

These photons need to be entangled as twins that are linked in time and space but physically separate.

But creating these entangled photons using current methods is expensive and inefficient.

Mr Biggerstaff is about to experiment with different entangled photon production methods using engineered crystals, mirrors, lenses and beam splitters.

“Scientists need good sources of entangled photons but one can't simply press a button and create a pair of entangled photons,” Mr Biggerstaff said.

He said entangled photons could be used as a study tool to show the potential of quantum computing and allowing completely secure messaging through unbreakable quantum encryption.

Information could be sent via single photons replacing signals sent in

groups of photons or pulses along fibre optic cable.

“A quantum computer, which is for now is a theoretical and far-off device, would be able to factor very large numbers or search large databases in a much more efficient manner than any classical computer.

“Quantum computation relies on the use of entangled quantum bits or qubits.

“Classical bits can only be in the state 0 or 1, whereas qubits can be in combinations of these two fundamental states and entangled.”

He said quantum encryption was not a new secret code but it would let either communicating party know of any outside eavesdropping.

Photon production methods could also be applied to quantum teleportation or information processing schemes which had been limited by source efficiency.

The 22-year-old from St Lucia is working with UQ's Centre for Quantum Computing Technology under Professor Andrew White.

He is one of 14 Americans granted a Fulbright postgraduate award scholarship in Australia.

“I was drawn to UQ largely on the strength of Professor White`s reputation as both a creative and prolific leader in this field and as a friendly, helpful, and fun mentor to his students.”

Source: University of Queensland

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