

Tangling with telecoms

Free-space quantum communication using lasers could form the basis for a global network that's impossible to hack or tap

Forget fibre optics, and for that matter, forget wireless. The biggest shake-up in interpersonal communication since Alexander Graham Bell is on the cards – and South Africans are at the forefront of the research. It's all about exploiting quantum mechanics, the somewhat alien and frequently contrary rules that apply to life at the submicroscopic level.

At the CSIR's National Laser Centre, a team of researchers is pursuing Free Space Quantum Communication: transmitting optical signals by using the quantum properties of laser light. The aim – according to principal researcher and project leader Dr Stef Roux – is to

provide secure and safe ways of communication using lasers as opposed to fibre optic cables.

Quantum “teleporting” operates on the principle that appropriately entangling a pair of photons interlinks their quantum states. Change one photon's quantum state, and you change its partner's – even if one of the photons has been beamed off and is now at a distance.

“We want to communicate through the atmosphere from one tower to another using light,” says Roux. “We are trying to use quantum properties of light to communicate in a secure way.”

In trying to achieve the aim of transmitting information vast distances without depending on a conventional signal, scientists in various parts of the world have succeeded in teleporting information between photons at ranges of up to about 15 kilometres. First demonstrated in 1997, the effect has until recently only been feasible using a fibre optic transmission line.

However, subsequent experiments have successfully sent them through free space with excellent fidelity. This holds tremendous potential for transmission with satellites. What's got everybody excited is that the theoretical upper

A MAN WHO KNOWS WHAT HE'S TALKING ABOUT

Stef Roux has two doctor's degrees: one in electronic engineering from the University of Pretoria and another in theoretical particle physics from the University of Toronto in Canada.

Roux, 47, says he became interested in optics while at UP. He joined the CSIR Aerotech (now known as the CSIR Defence, Peace, Safety and Security's Aeronautics Systems Competency) in the late 1980s and later moved to Potchefstroom University (now North-West University) to work as a researcher/lecturer.

“While there I developed an interest in particle physics,” he says. He couldn't resist the hankering to study particle physics (after all, who can?) so he left to study further in Canada. Having fulfilled his ambitions, he returned to optics and went to work for a company called JDS Uniphase Corporation in Ottawa, focusing on the design of optical fibre components.

“While at this company, there was a telecom bust and the timing was bad, so I left again – this time for the University of Ottawa,” he says.

Roux eventually returned to South Africa in 2004 and went to work at UP before joining the CSIR's Laser Centre in 2009.

