'Hidden photons' to send secret emails through Earth

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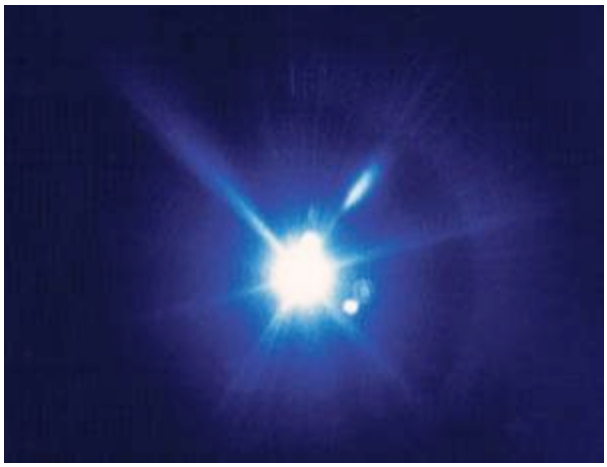

The German Electron Synchrotron (DESY) has been used to study the behaviour of photons, as in this image, but scientists there are now investigating the possibility of "hidden photons" (Image: DESY, Hamburg)

IF YOU shine a laser on the floor, where does the light go? With the right preparation, some of it might pop out at the other side of the world - an effect that could be exploited to transmit secret messages through the ground.

That is the conclusion of Andreas Ringwald at the German Electron Synchrotron (DESY) in Hamburg, and colleagues, who have explored the possibility of hypothetical particles called "hidden photons" (www.arxiv.org/abs/0903.5300). "If such particles exist, then we can use them to communicate," says Ringwald. "It's very simple."

Hidden photons are a class of particles predicted by so-called supersymmetric extensions to the standard model of particle physics. Unlike normal photons, hidden photons could have a tiny mass and would be invisible because they would not interact with the charged particles in conventional matter. This means hidden photons would flit through even the densest materials unaffected.

The only place to spot them is in a vacuum, where they should sometimes "oscillate" into normal photons. There are already experiments searching for this effect: the idea is to shine a laser at a wall in a vacuum and see if any of the photons make it through to the other side by transforming into their hidden counterparts and back again. According to Ringwald's group, if these experiments succeed it should be possible to scale up the apparatus so that the hidden photons become signal carriers and the "wall" becomes any stretch of ground or water.

Hypothetical 'hidden photons' could beam messages through any stretch of ground or water
The benefit of such a communication method is that, unless someone were in the exact line of sight with appropriate equipment, it would be impossible to eavesdrop. For example, submarines could employ the system to avoid communicating via sound, which is easily intercepted. Hidden photons could even take messages where radio signals cannot reach, such as the far side of the moon.

Physicist Doug Shaw at Queen Mary, University of London, thinks it would be a "technical challenge" to line up transmitters and receivers over large distances, but he agrees a system is feasible in principle. "It's a nice idea," he says. "Unlike most hypothetical particles that are only accessible at high energies, these particles, if they exist, would have potentially useful real-world applications."

However, Malcolm Fairbairn, a physicist at King's College London, points out that over the 12,700-kilometre diameter of the Earth, the signal capacity would be just 1 bit per second: "At that speed it would take about a year to download an mp3 file, so I'm not sure who would use it."