

Look around corners with the quantum periscope

A quantum camera being developed in the UK can see objects hidden behind walls or other barriers. It could be used to aid rescuers and improve the safety of self-driving cars.

- Quantum sensors detect single photons, at a trillion frames per second
- The camera can pinpoint people hiding behind a wall 100 metres away
- Future versions could give full 3D colour images

This device is based on the power to detect single photons and time their travel. First, a laser shines at a spot behind and to one side of the barrier. Photons scatter from that spot in all directions. Some of them bounce off each object behind the wall, and a fraction of those then bounce back towards the camera via the ground or another surface.

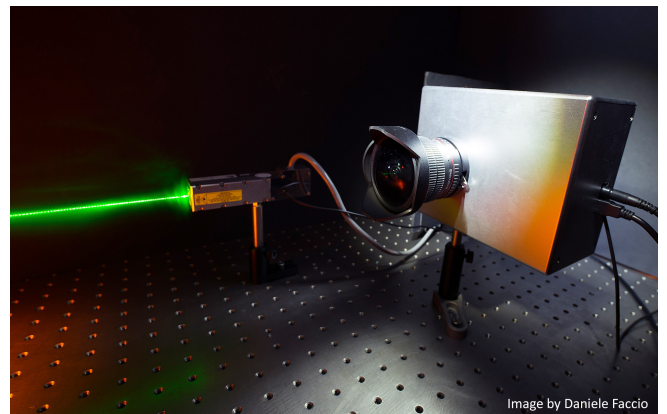
The laser is fired in a series of very brief pulses, and the camera measures the time taken by each photon on its return journey, to show how far it has travelled. With enough photons, this information can be used to calculate the position of each object behind the wall. Only a tiny proportion of photons in the original laser beam end up back at the camera, but its single-photon avalanche detectors are so sensitive they can pick up this faint signal.

A collaboration between the University of Glasgow, Heriot Watt University and Thales developed this prototype device, called the Hidden Object Tracker. Dstl gave the collaboration a focused brief to be able to detect people and their movement in another building at least 30 metres away.

The team demonstrated their camera in 2018. “We can look behind corners located up to 100 metres away, even in full daylight. As far as I know no-one else has even tried to do this.” says Daniele Faccio at Heriot Watt University.

This technology could be invaluable for search & rescue, security, automated vehicles and even space exploration. It could also be used to see through fog and other cloudy media; and with advances in computing it will generate detailed images of hidden objects.

None of this would have happened without QuantIC – the National Quantum Technology Programme’s imaging hub. The project is funded through QuantIC and other EPSRC grants; the single-photon detectors are made within QuantIC; and the hub provides vital links to industry. “Since we started four years ago, we went from thinking we might be able to do this, to being a world leading group. I think this is a success story of the hub as a whole.”



For more information, visit uknqtp.epsrc.ac.uk or contact quantumtechnologies@epsrc.ukri.org

The UK National Quantum Technologies Programme aims to ensure the successful transition of quantum technologies from laboratory to industry. The programme is delivered by EPSRC, Innovate UK, BEIS, NPL, GCHQ, Dstl and KTN.