Research team finds way to use photon shape to encode messages

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(Phys.org) -- In their quest to find the perfect encryption technique, scientists have often looked to light, or more specifically, photons. Current techniques allow for sending signals as 1's or 0's based on the polarization of individual photons, i.e. they are either vertical or horizontal. But now it appears there is a better way, using the unique shape of photons to represent as many characters as needed, the alphabet, for example. A team of international researchers has, as they describe in their paper published in the journal *Physical Review Letters*, found a way to use lasers to identify unique shapes of photons and to then recover information that was encoded in them.

The problem with using the shape of a photon for encryption, at least up till now, has been that its shape is based on predicting it at a given time and place, and the fact that its shape will be distorted when it's sent through media, such as a fiber optic cable. To get around these problems, the team, led by Marco Bellini fired a laser beam in the same direction as a moving photon, which either canceled out the photon's signal or increased its strength, thus making it easier to detect. To find just the right laser shot, the team fired multiple short bursts until landing on the one that strengthened the signal enough to be measured.

To reduce the number of test shots that needed to be fired to optimize the photons signal strength (i.e. instead of firing random laser pulses until hitting on just the right one) the team very ingeniously used a genetic algorithm to fine tune the parameters, and because of that, were able to zero in on just the right one far more quickly.

Then, having devised a means for detecting the signal from the photon, the team proved their technique allowed for the decoding of data within it, by emitting photons that were specifically shaped according to preset frequencies and then detecting those frequencies using their laser technique. As further proof they then set the frequency of a photon to its opposite phase, which of course was not detected by the laser, thus proving that they were detecting only the photon signal they were actually looking for.

The technique the team developed won't result in break-proof encryption technology any time soon of course, but it does show that it's truly possible, which should be more than enough to inspire further research.

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