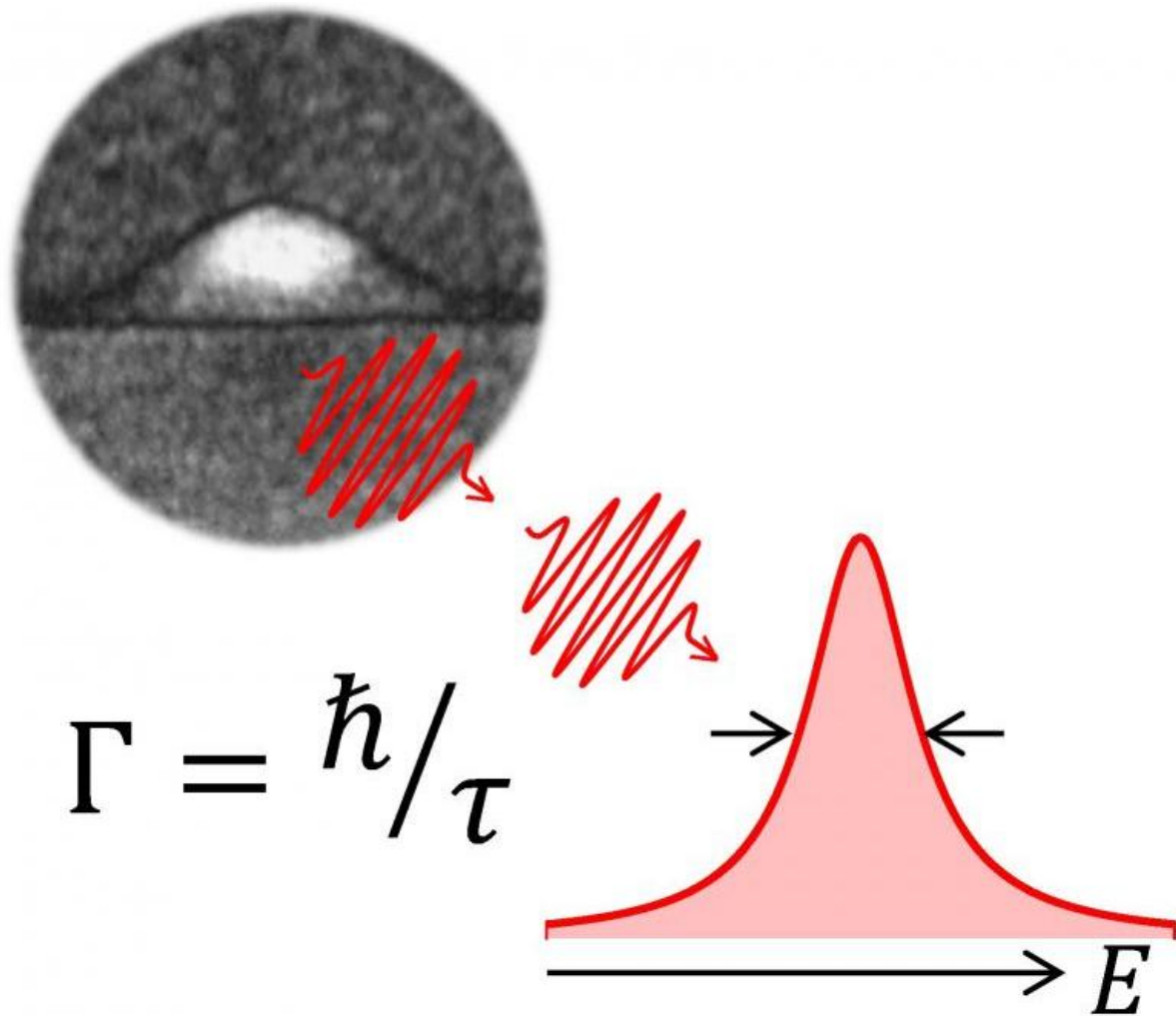


Researchers develop ideal single-photon source

September 7 2015



Semiconductor quantum dot emitting a stream of identical photons.

With the help of a semiconductor quantum dot, physicists at the University of Basel have developed a new type of light source that emits single photons. For the first time, the researchers have managed to create a stream of identical photons. They have reported their findings in the scientific journal *Nature Communications* together with colleagues from the University of Bochum.

A single-photon source never emits two or more photons at the same time. Single photons are important in the field of quantum information technology where, for example, they are used in quantum computers. Alongside the brightness and robustness of the light source, the indistinguishability of the photons is especially crucial. In particular, this means that all photons must be the same color. Creating such a source of identical single photons has proven very difficult in the past.

However, quantum dots made of semiconductor materials are offering new hope. A quantum dot is a collection of a few hundred thousand atoms that can form itself into a semiconductor under certain conditions. Single electrons can be captured in these quantum dots and locked into a very small area. An individual photon is emitted when an engineered quantum state collapses.

Noise in the semiconductor

A team of scientists led by Dr. Andreas Kuhlmann and Prof. Richard J. Warburton from the University of Basel have already shown in past publications that the indistinguishability of the photons is reduced by the fluctuating nuclear spin of the quantum dot atoms. For the first time ever, the scientists have managed to control the nuclear spin to such an extent that even photons sent out at very large intervals are the same color.

Quantum cryptography and quantum communication are two potential

areas of application for single-photon sources. These technologies could make it possible to perform calculations that are far beyond the capabilities of today's computers.

More information: "Transform-limited single photons from a single quantum dot," *Nature Communications* 6:8204 (2015) | DOI: 10.1038/ncomms9204

Provided by University of Basel

Citation: Researchers develop ideal single-photon source (2015, September 7) retrieved 26 April 2024 from <https://phys.org/news/2015-09-ideal-single-photon-source.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.