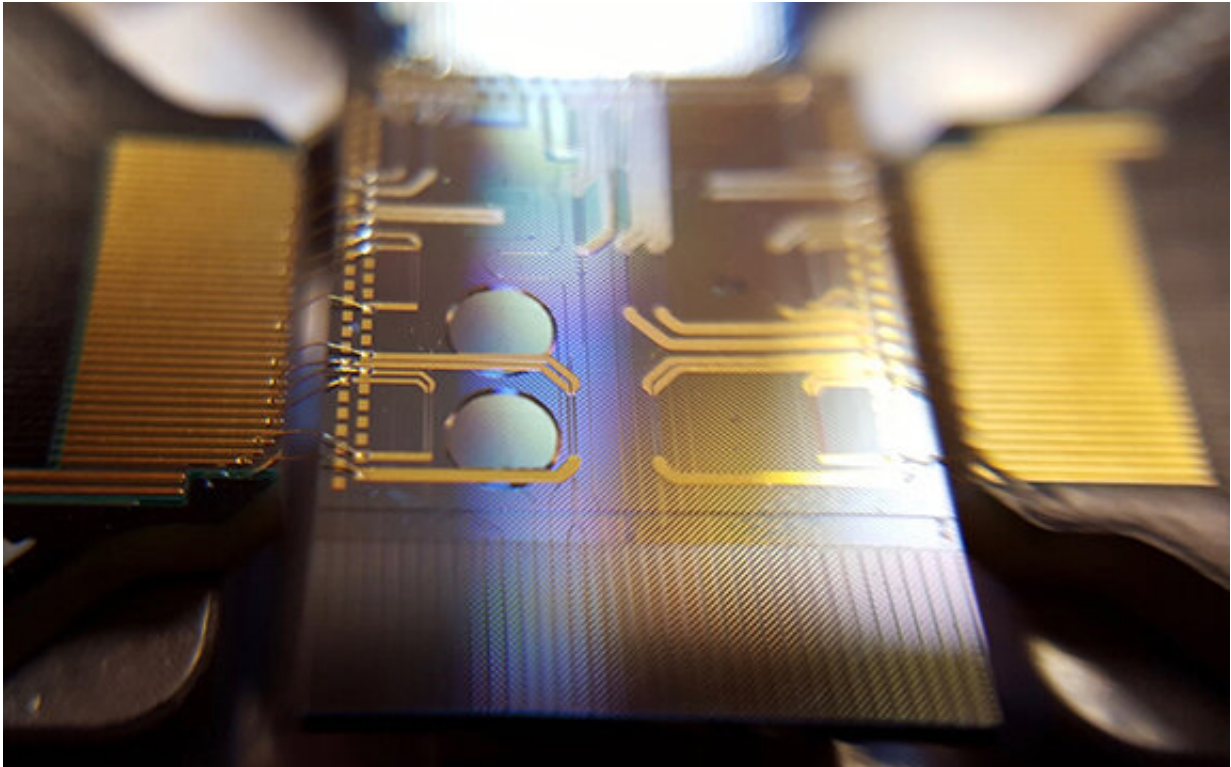


Quantum optical micro-combs

February 25 2019



Integrated ring resonator circuitry that is used to generate quantum optical frequency combs. Credit: Swinburne University of Technology

Compact quantum devices could be incorporated into laptops and mobile phones, thanks in part to small devices called quantum optical micro-combs.

Quantum optical micro-combs are devices that generate very sharp

precise frequencies of light an equal distance apart – a bit like the teeth of a comb. They can enable ultrafast processes and could be an important component of quantum computer systems.

In a review paper covering the development of these devices, Professor David Moss, Director of the Centre for Micro-Photonics (CMP) at Swinburne describes the advances that have been made in making these devices smaller and portable enough to be included on a chip.

"These devices will enable an unprecedented level of sophistication in generating entangled photons on a chip – a key breakthrough that, in my opinion, could very well accelerate the quest of achieving so-called 'quantum supremacy' – quantum devices that have the ability to perform functions beyond the capability of conventional electronic computers", says Professor Moss.

A key challenge for quantum science and technology is to develop practical large-scale, systems that can be precisely controlled. Quantum optical micro-combs provide a unique, practical and scalable framework for quantum signal and information processing to help crack the code to ultra-secure telecommunications and greatly advance quantum computing.

Quantum optical micro-combs have achieved record complexity and sophistication in the photon quantum version of a classical computer bit, a QuDit, that can be generated and controlled in the tiny space of a [computer](#) chip.

These breakthroughs have shown that compact, highly complex quantum can exist outside of large laboratories, opening the possibility that ultimately- [quantum devices](#) could be used in laptops and mobile phones, bringing the vision of powerful optical [quantum](#) computers for everyday use closer than ever before.

More information: Michael Kues et al. Quantum optical microcombs, *Nature Photonics* (2019). [DOI: 10.1038/s41566-019-0363-0](https://doi.org/10.1038/s41566-019-0363-0)

Provided by Swinburne University of Technology

Citation: Quantum optical micro-combs (2019, February 25) retrieved 6 May 2024 from <https://phys.org/news/2019-02-quantum-optical-micro-combs.html>

<p>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.</p>
--