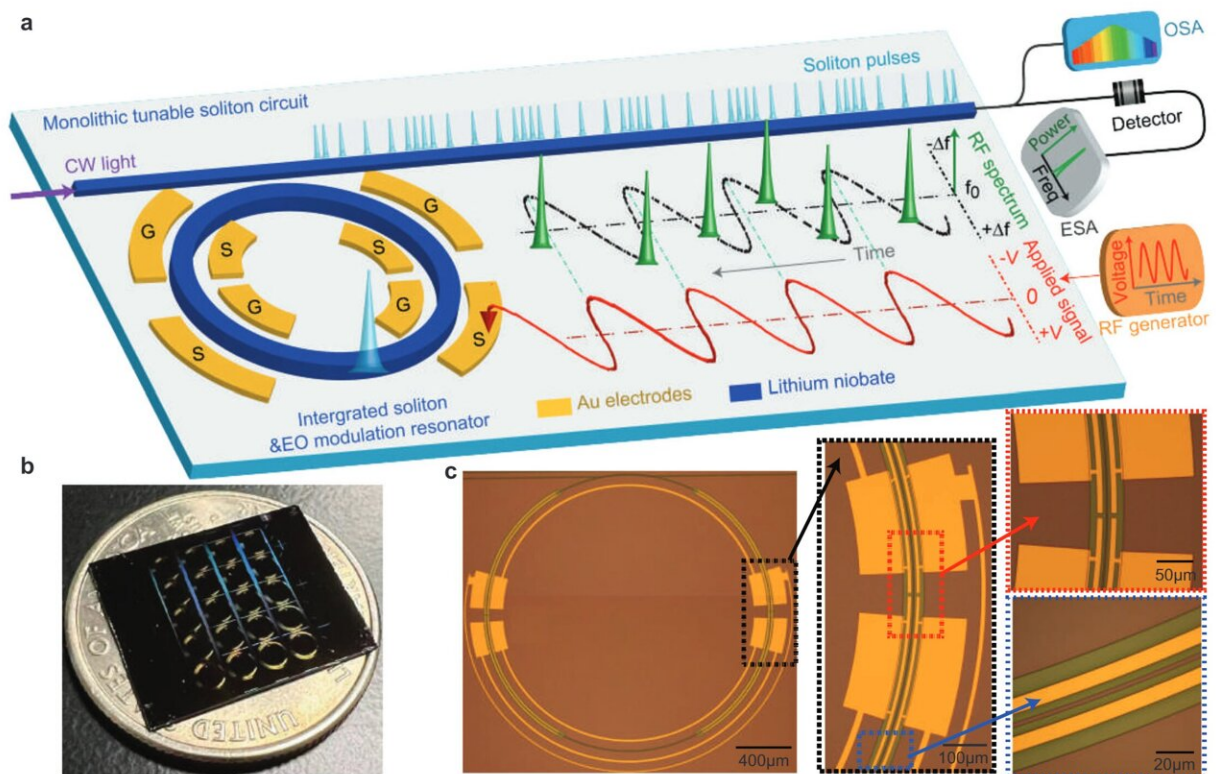


New microcomb device advances photonic technology

June 21 2023



Concept of the high-speed tunable microwave-rate soliton source. a Schematic of the tunable soliton source and its operational principle. CW continuous-wave, OSA optical spectrum analyzer, ESA electrical spectrum analyzer. b Photo of an LN comb resonator chip. c Optical images of a device and the detailed structure of the driving electrodes and resonator waveguide. Credit: *Nature Communications* (2023). DOI: 10.1038/s41467-023-39229-3

A new tool for generating microwave signals could help propel advances in wireless communication, imaging, atomic clocks, and more.

Frequency combs are [photonic devices](#) that produce many equally spaced laser lines, each locked to a specific frequency to produce a comb-like structure. They can be used to generate [high-frequency](#), stable [microwave signals](#) and scientists have been attempting to miniaturize the approach so they can be used on microchips.

Scientists have been limited in their abilities to tune these microcombs at a rate to make them effective. But a team of researchers led by University of Rochester's Qiang Lin, professor of electrical and [computer engineering](#) and optics, outlined a new high-speed tunable microcomb in *Nature Communications*.

"One of the hottest areas of research in nonlinear integrated photonics is trying to produce this kind of a frequency comb on a chip-scale device," says Lin. "We are excited to have developed the first microcomb device to produce a highly tunable microwave source."

The device is a lithium niobate resonator that allows users to manipulate the bandwidth and frequency modulation rates several orders-of-magnitude faster than existing microcombs.

"The device provides a new approach to electro-optic processing of coherent microwaves and opens up a great avenue towards high-speed control of soliton comb lines that is crucial for many applications including frequency metrology, frequency synthesis, RADAR/LiDAR, sensing, and communication," says Yang He, who was an electrical and computer engineering postdoctoral scholar in Lin's lab and is the first author on the paper.

More information: Yang He et al, High-speed tunable microwave-rate

soliton microcomb, *Nature Communications* (2023). [DOI: 10.1038/s41467-023-39229-3](https://doi.org/10.1038/s41467-023-39229-3)

Provided by University of Rochester

Citation: New microcomb device advances photonic technology (2023, June 21) retrieved 29 April 2024 from <https://phys.org/news/2023-06-microcomb-device-advances-photonic-technology.html>

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