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The Accelerator on a Nanophotonic Chip

Thursday 16 October 2025 16:00 (1 hour)

The highly successful RF accelerator technology is based on a structured vacuum, fit to the wavelength of the driving RF or microwave fields. The same principle can be used with light. Because the wavelength of light lies around 1 micron, acceleration structures need to be fabricated with a feature size on the sub-micron scale –a standard size for cleanroom-based nanofabrication. We will show that we can now build laser-powered nanophotonic structures that not only accelerate electrons but that also keep them together. For this, we use alternating phase focusing, a well-known scheme also used in RF ion accelerators. We employ it in the nanophotonics realm to keep the injected electrons on track in the 200nm narrow acceleration channel. Based on this, we can now accelerate electrons over 0.5mm and observe substantial energy gains. The current status of on-chip accelerators will be presented, with an outlook on near term goals and far term opportunities.

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