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Accelerator on a chip: Recent results and perspectives for applications

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Nanophotonic laser acceleration is a fast-evolving, emerging field aimed at providing a solution to the miniaturization of electron accelerators, down to the chip-scale. Although the average gradients are still limited by the material breakdown threshold (up to ~10 GV/m), this technology currently already offers acceleration of superb-quality single-electron pulses (normalized emittance ~100 pm*rad) at kHz and potentially MHz repetition rates, and favorably at academic-scale costs and settings. The opportunity to design accelerator structures and nanofabricate them in a university clean-room is a great advantage for cutting-edge research in quantum electron-light interaction, and to the recent proposals for the temporal modulation of electron wavepackets in the attosecond regime, potentially soon in the MeV energy range.
In this talk I will give an overview of the current state of nanophotonic acceleration research, with the different schemes being pursued both theoretically and experimentally, some recent proposals and application directions, and the latest results in the sub-relativistic (~30 keV) regime.

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