



Adaptive Electron-Beam Shaping with Light

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Abstract

Electron microscopes can reveal structures far smaller than light microscopes, but their performance has long been limited by unavoidable focusing imperfections, most notably spherical and chromatic aberrations, which have plagued electron optics since the field began. In this seminar I will describe an emerging approach in which tailored light fields act as a programmable “lens” for electrons, reshaping the electron wavefront without bulky hardware. I will explain how this optical control can address both spherical and chromatic aberrations and enable flexible electron beam profiles on demand, then discuss recent experimental progress and what it could mean for next-generation electron imaging and instrumentation [1-4].

References:

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2. Chirita Mihaila MC, Laštovičková Streshkova N, Kozák M. *Physical Review Letters* (2025) 134, 203802. <https://doi.org/10.1103/PhysRevLett.134.203802>
3. Chirita Mihaila MC and Kozák M. *Optics Express* (2025) 33, 758–775. <https://doi.org/10.1364/OE.542930>
4. Chirita Mihaila MC, Koutenský P, Moriová K, Kozák M. *Nature Photonics* (2025) 19, 1309–1314. <https://doi.org/10.1038/s41566-025-01760-8>