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Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
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Near-field-mediated photon-electron interactions

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Abstract

Being either in the form of spontaneous emission from the electron beams interacting with samples, or stimulated interactions due to pre-excitation by laser beams, electron microscopes provide by far the most flexible and multipurpose means for characterizing various kinds of material excitations. Moreover, photon-electron interactions in electron microscopes have emerged as new mechanisms for controlling the electron wavepackets.

Here, I provide our recent studies in near-field mediated photon-electron interactions and motivate the need for providing techniques for improving the time resolution of ultrafast electron microscopes. Examples where electron beams were used to probe strong-coupling effects and the formation of exciton polaritons are provided. I further elaborate on our attempts for controlling the radiation from electron beams, and use them for phased-locked correlative photon-electron spectroscopy.