

A few “quantum” and spooky ideas and experiments in electron microscopy

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The use of quantum methodologies and ideas in electron microscopy is promising and already producing a complete paradigm shift in electron microscopy. In this contribution I will discuss a few interesting ideas and experimental results for my personal approach on the topic of quantum experiments.

There is a common denominator connecting from the new idea of ghost imaging, computational ghost imaging (CGI), coherence determination and inelastic interferometry and I will try to highlight how the present and future TEM technologies can produce a new way of considering elastic and inelastic scattering. The tool for this is the beam shaping technology and I will explain present advances in both the MEMS technology to produce innovative electron optics and the Ultrafast TEM-based near field light-electron beam modulation approach.

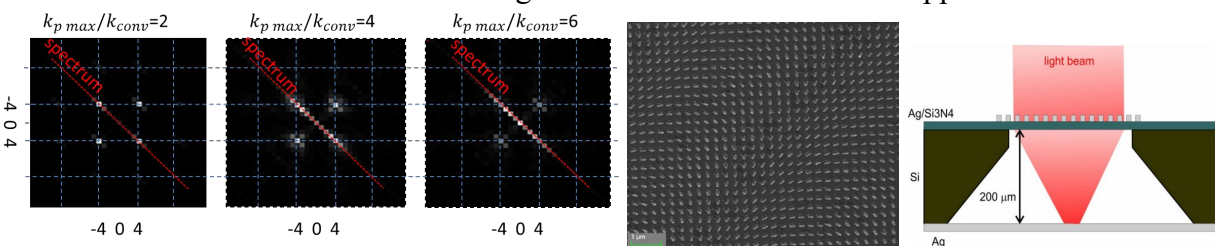


Fig. 1 Left: density matrix models in OAM representation describing incoherence in plasmon scattering. Right: metalenses for electron–optics interaction that allow for a better resolution in controlling the e-beam

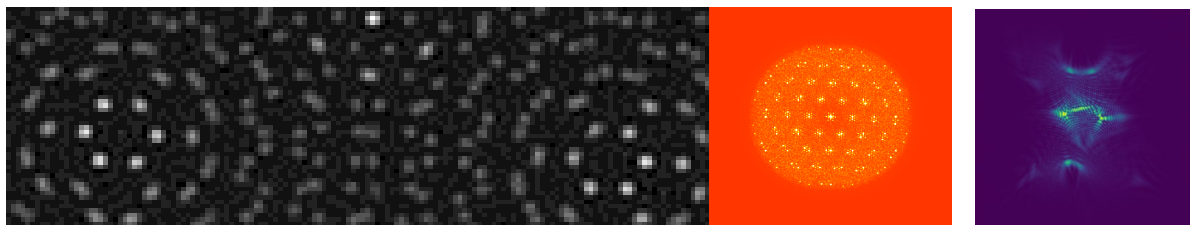


Fig. 2 Example of simulations for CGI reconstruction and experimental image of one of the caustics used to illuminate the sample. CGI can increase the microscope resolution beyond aberrations