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True Attosecond Imaging of Inhomogeneous Systems with Standing-Wave Inelastic X-Ray Scatterin[1] YU GAN, PETER ABBAMONTE, University of Illinois at Urbana-Champaign — Inelastic X-ray scattering (IXS) has recently been used to image electron dynamics at the attosecond scale, but it has been shown that these images are spatially averaged. The problem is that the existing technique can only access the "diagonal" ($k_1 = -k_2$) elements of the electron density response $\chi(k_1, k_2, \omega)$. It has been shown, however, that inelastic X-ray scattering at the Bragg position is sensitive to the entire response $\chi(k_1, k_2, \omega)$. With this method, a standing wave field is established in the sample by exciting a Bragg condition, allowing access to all the off-diagonal ($k_1 \neq -k_2$) elements of χ. In this talk I will present a simple model demonstrating that, in principle, this approach can be used to map the entire density response. In particular, I show that a one-dimensional system is experimentally impossible to probe, a two-dimensional system is experimentally accessible but typically difficult to measure in practice, and a three-dimensional system is experimentally both plausible and practicable. Finally, I propose possible experimental realizations of this technique.

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Yu Gan
University of Illinois at Urbana-Champaign

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