Quasiparticle Interference as a tool to understand quantum materials

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Quasiparticle interference (QPI), the scattering of itinerant electrons at defects, has since its discovery about 30 years ago[1] developed into a powerful tool to study the electronic structure of materials. It enables a method based on real space imaging, scanning tunnelling microscopy, to determine k-space electronic structure. The extraction is, however, indirect, so far largely based on qualitative analysis. Recent advances in simulations of quasiparticle interference have made it possible to extract quantitative information about the band structure of correlated materials from measurements of QPI.[2]

In my talk, I will review the recent progress on modelling QPI, and demonstrate for a few select strongly correlated electron materials the level of precision that can be achieved in determining the electronic structure, and how the realistic modelling allows to benchmark theories against experiments and obtain a deep understanding of the underlying physics of the interacting electron systems.[3-6]

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References

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