

Beyond Structure: Probing Complex Properties with Subnanometer Resolution

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The last decade has witnessed a dramatic expansion of the number of scanning probe microscopy variants. Unsurprisingly, those based on scanning tunneling microscopy and non contact atomic force microscopy routinely achieve atomic spatial resolution of geometric and electronic structure. Perhaps more surprising has been recent demonstrations of nm scale resolution of continuum properties such as resistance, conductance, and capacitance. This raises the questions: What is its ultimate limit of spatial resolution for properties? Can we hope to probe properties at molecular resolution?

We address this question in the context of defects in oxide thin films and atomically abrupt oxide interfaces. This talk will outline a strategy for accessing local properties by extracting information from multiple modulation of signals and high order harmonic detection in scanning probes. The origins of subnanometer spatial resolution will be discussed.