Abstract Submitted
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Visualizing spatial correlation: structural and electronic orders in iron-based superconductors on atomic scale[1] ARTEM MAKSOV, University of Tennessee, Knoxville, MAXIM ZIATDINOV, LI LI, ATHENA SEFAT, PETRO MAKSYMOVYCH, SERGEI KALININ, Oak Ridge National Laboratory — Crystalline matter on the nanoscale level often exhibits strongly inhomogeneous structural and electronic orders, which have a profound effect on macroscopic properties. This may be caused by subtle interplay between chemical disorder, strain, magnetic, and structural order parameters. We present a novel approach based on combination of high resolution scanning tunneling microscopy/spectroscopy (STM/S) and deep data style analysis for automatic separation, extraction, and correlation of structural and electronic behavior which might lead us to uncovering the underlying sources of inhomogeneity in in iron-based family of superconductors (FeSe, $BaFe_2As_2$). We identify STS spectral features using physically robust Bayesian linear unmixing, and show their direct relevance to the fundamental physical properties of the system, including electronic states associated with individual defects and impurities. We collect structural data from individual unit cells on the crystalline lattice, and calculate both global and local indicators of spatial correlation with electronic features, demonstrating, for the first time, a direct quantifiable connection between observed structural order parameters extracted from the STM data and electronic order parameters identified within the STS data.

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