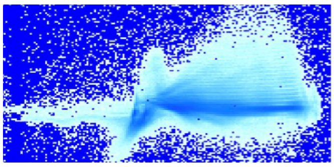

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Exploiting the coherence of synchrotron soft x-rays to study the dynamics of quantum matter

Wednesday, June 19, 2024 9:05 AM (30 minutes)

A challenging aspect of designing functional materials is to understand the impact of a wide range of characteristic spatial and temporal scales on stabilizing novel phases. Commonly used mean field approaches often provide reasonable estimates for static properties at macroscopic length scales. However, it does not provide the requisite fundamental insight into the important processes governing deviations from these averages where fluctuations play a critical role. Soft x-rays are a powerful element-specific probe to study such mesoscopic charge and spin textures. The coherence available at current and newly upgraded light sources can enhance our established tools to give significantly more detailed information of otherwise difficult to probe quantum states. We select the coherent part of the x-ray beam to produce an interference pattern known as speckle. Here I will discuss how we use that speckle at the Advanced Light Source to look inside, and better understand the transitions in collective electronic systems such as those of orbital ordering, metal-to-insulator materials and amorphous helical magnets1,2.
References:
[1] Singh, A., Hollingworth, E., Morley, S. A., et al., “Characterizing Temporal Heterogeneity by Quantifying Nanoscale Fluctuations in Amorphous Fe-Ge Magnetic Films”, Adv. Funct. Mater. 33, 2300224, 2023. https://doi.org/10.1002/ADFM.202300224
[2] Tumbleson, R., Morley, S. A., et al., “Nematicity of a Magnetic Helix”, arXiv:2404.13212

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Session Classification: XPCS and Polarised beams