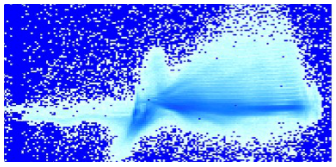

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Exploring memory effects in Quantum Materials

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Soft X-ray coherent techniques have proved to be a powerful tool in the investigation of static and dynamic phenomena in solid-state quantum materials, such as ultrafast light-induced phase transitions [1], fluctuating domains [2] or memory effects [3]. One particular aspect of phase transitions is their possibility of being non-reversible and/or stochastic, which ties into mostly unexplored underlying physical mechanisms and is critical when devising functional devices that exploit the nanoscale behaviour of a given system. Coherent Diffractive Imaging (CDI) and Fourier Transform Holography (FTH) can provide the spatial resolution, contrast mechanisms and sample environments required to tackle the nanoscale repeatability of a transition under a variety of conditions. Here we show a study on the repeatability of the light induced insulator-to-metal phase transition in the prototypical material VO_2, showing stochastic behaviour, unstable domains with different lifetimes and permanent metallic domains stable well below the critical temperature. In addition, we will present recent advances in the coherent imaging program of the BOREAS beamline at ALBA Synchrotron, highlighting imaging on magnetic Van der Waals materials.

References:
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