**Poster-2-5**

# Induced and Innate Defects in Ferroelectrics and their Effects on Switching Dynamics

Ralph Bulanadi,[1] Kumara Cordero-Edwards,[1] Philippe Tückmantel,[1] Sahar Saremi,[2] Giacomo Morpurgo,[1] Qi Zhang,[3] Lane W. Martin,[2,4] Valanoor Nagarajan,[3] and Patrycja Paruch[1]

[1] *Department of Quantum Matter Physics, University of Geneva, 1211, Geneva 4, Switzerland*
[2] *Department of Materials Science and Engineering, University of California, Berkeley, CA94720, USA*
[3] *School of Materials Science and Engineering, The University of New South Wales, Sydney, NSW 2052, Australia*
[4] *Materials Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA94720, USA*

Ferroelectric materials, such as lead titanate, spontaneously retain electrical dipoles, allowing the coexistence of macroscopic polarisation domains with different orientations. The walls between such domains have been modelled as a disordered elastic system, and their dynamics have been observed to follow avalanche statistics. The universality of these classifications allows for modelling of domain walls at larger scales than typically possible via *ab initio* methods. While recent studies have focused on the importance of strongly varying disorder landscapes in the films [1], little is known about the role of strong vs. collective pinning.

Here we report scanning probe microscopy studies into the switching dynamics of lead titanate thin films with varied and controlled defect disorder. Under increasing voltage bias, all samples follow avalanche statistics with similar critical exponents, regardless of bombardment defect density. The a-domains, meanwhile, appear to act as extended strong pinning sites, imposing directional constraints on the domain wall motion along the film crystallographic axes.

In this complex disorder landscape, our observations suggest that point defects therefore screen the effects of a-domains, yielding anomalous behaviour that is locally constrained around a-domains in the non-bombarded sample, while being statistically similar on a larger scale to ion-bombarded datasets.

[1] Tückmantel, P., et al. Phys. Rev, Lett. 126 (2021): 117601.