Dynamics of Nanowalls In Ferroelectric Ultrathin Films\textsuperscript{1} QINGTENG ZHANG, RYAN HERCHIG, INNA PONOMAREVA, Department of Physics, University of South Florida — Nanoscale ferroelectric films can exhibit nanostripes that are nanoscopic regions of “up” and “down” polarizations, hence forming domain walls which separate nanodomains with different polarization directions. The dynamical properties of domain walls are of technological importance since they are at the heart of ultradense ferroelectric memory technology and may play an important role in nanoscale ferroelectric sensors, actuators, and others. Here \cite{1} we take advantage of accurate first-principle-based simulations to reveal the intrinsic dynamics of nanodomains in ultra-thin PbTi\textsubscript{0.6}Zr\textsubscript{0.4}O\textsubscript{3} films with thickness ranging from 2 to 20 nm. We first demonstrate that the nanodomain walls oscillate under driving AC-field of sub-switching amplitude. Secondly, we reveal that nanowalls can exhibit two types of intrinsic dynamics (resonance and relaxation) at the same frequencies. Thirdly, we prove that at nanoscale the dynamics is determined by the domain size which manifests itself via a unique size-driven transition from relaxational to resonance dynamics.

\cite{1} Q. Zhang et al, Phys. Rev. Lett. 107, 177601 (2011).

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Qingteng Zhang
Department of Physics, University of South Florida

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