

Self-similar domain patterns and global topological defects in near-transition ferroelectrics

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Ferroelectric solid-solution crystals manifest a rich and interesting domain phenomenology, a complexity-driven arena that plays an important role both in our exploration of fundamental physics, such as for topological phases, and of pioneering applicative concepts in electronic and photonics. Here we present our recent experimental progress in metastable nanodisordered potassium-tantalate-niobate. We discuss the optical observation of spontaneous self-similar patterns and their dynamics, suggesting possible scenarios for their explanation and their use in optical memory and processing. We also discuss our recent discovery of global topological defects, ferroelectric patterns that appear to interlace to form stable macroscopic patterns able to store information in a topologically protected structure that can be optically encoded and decoded. We discuss how the underlying complexity allows the design of structures with synaptic adaptability.



Short Bio:

Eugenio DelRe is a professor at the Physics Department of the University of Rome La Sapienza where he leads an Experimental Photonics Group focused on light propagation in near-transition ferroelectrics.