复旦大学物理系物质科学报告

Physics Department Colloquium

Cosmic strings in multiferroics

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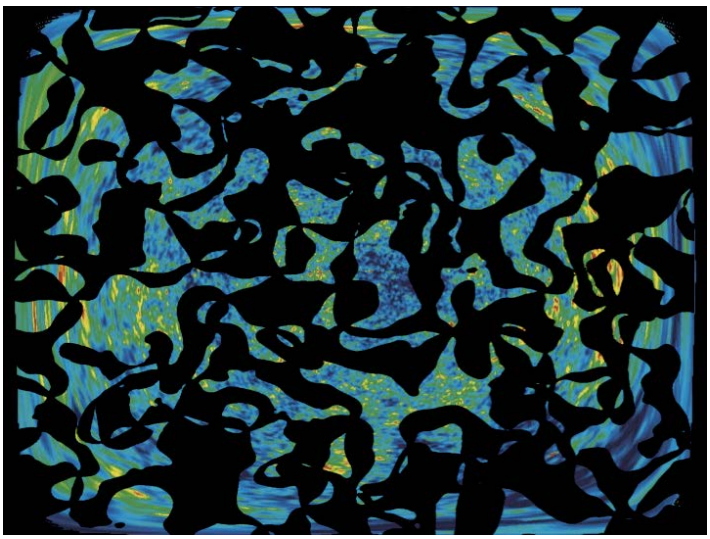

A key open question in cosmology is whether the vacuum contains topological defects such as cosmic strings, believed to have formed as a result of symmetry-lowering phase transitions in the early universe. An inexpensive, laboratory-based route to shedding light on the answer is to test the predicted scaling laws for topological defect formation (the so-called Kibble-Zurek mechanism) in condensed matter systems. Here we show that the multiferroic hexagonal manganite oxides -- with their coexisting magnetic, ferroelectric and antiphase orderings -- have an appropriate symmetry-lowering phase transition for testing the Kibble-Zurek scenario. We present an analysis of the Kibble-Zurek theory of topological defect formation applied to the hexagonal magnanites, show that the recently observed domain vortex cores are formally topologically protected, and that recent literature data are quantitatively consistent with our predictions from first-principles electronic structure theory. Finally, we explore experimentally for the first time to our knowledge the cross-over out of the Kibble-Zurek regime and find a surprising "anti-Kibble-Zurek" behavior.

Time：2:00 pm, Tuesday, 2013.12.17

Location：Physics Building, Room 221B

(Cookies and coffee are served from 1:30 pm)