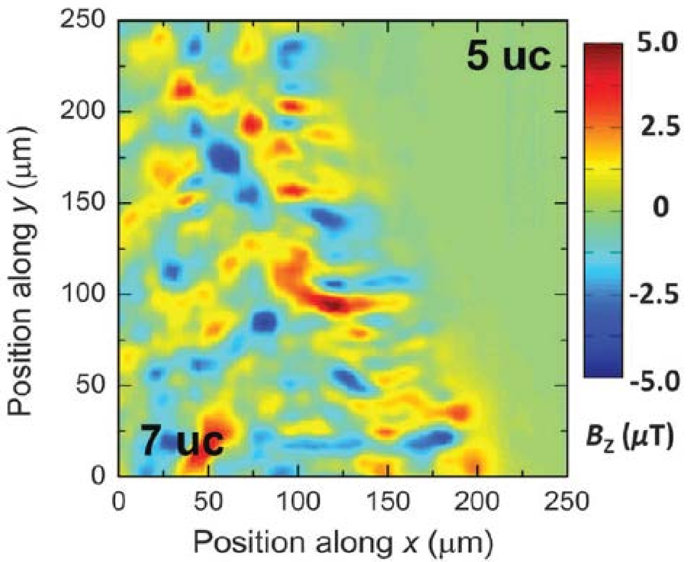
UNIVERSITÄT DUISBURG ESSEN | PHYSIK

Physikalisches Kolloquium

Mittwoch, 07.11.2018
13:00 Uhr
Hörsaal MC 122

Electronic nanosystems in transition

Prof. Dr. Hans Hilgenkamp
MESA+ Institute for Nanotechnology, University of Twente



Scanning SQUID Magnetic Microscopy image showing the difference in magnetic behaviour for a $LaMnO_3$ thin film with a thickness of 7 unit cells (≈ 2.8 nanometers, left side) and 5 unit cells (≈ 2.0 nanometers, right side). From [4].

Phase transitions are among the most appealing phenomena in nature. The abrupt change of a physical property as a function of e.g., temperature or pressure or other quantities can also disclose important information on the physics underpinning the materials characteristics, and be useful for applications such as sensors or switches.

One of the attractive features of nanostructures is that they show behavior that is different from macro-scale bulk materials. These also include novel phase transitions, for example when critical dimensions are surpassed, or based on typical nanoscale phenomena such as confinement or quantum-tunneling.

In this talk, I will discuss three examples; the transition from an insulating to a conducting state in thin film systems of $LaAlO_3$ on $SrTiO_3$ when a critical $LaAlO_3$ thickness is surpassed [1,2], a related magnetic transition in thin films of $LaMnO_3$ on $SrTiO_3$ [3] (see figure), and a current-driven dynamic vortex Mott insulator-to-metal transition in superconducting nanostructured arrays [4].

[1]: S. Thiel, et al., Science 313, 1942 (2006).
[2]: A.E.M. Smink, et al., Phys. Rev. Lett. 118, 106401 (2017).
[3]: N. Poccia, et al., Science 349, 1202 (2015).
[4]: X.R. Wang et al., Science 349, 716 (2015).