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Novel magnetic structure of one monolayer Fe on Ir(111) STEFAN HEINZE, KIRSTEN VON BERGMANN, ELENA VEDMEDENKO, MATTHIAS BODE, ROLAND WIESENDANGER, Institute of Applied Physics, University of Hamburg, Jungiusstrasse 11, 20355 Hamburg, Germany, GUSTAV BIHLMAYER, STEFAN BLÜGEL, Institut für Festkörperforschung, Forschungszentrum Jülich, 52425 Jülich, Germany — Due to the interplay between symmetry, nearest-neighbor spacing, and hybridization with the substrate surprising magnetic ground-states can occur for monolayer films such as the two-dimensional antiferromagnetism of Fe on W(001) [1]. Much more complex magnetic structures have been predicted for monolayer thick films of an antiferromagnet on a triangular lattice given e.g. by an (111) fcc surface. To our knowledge, however, there is no experimental proof.
Here, we report a novel, nanometer scale magnetic structure for one monolayer Fe on Ir(111). Based on the observed contrast in spin-polarized scanning tunneling microscopy (SP-STM) measurements a giant magnetic unit cell consisting of 15 Fe atoms is suggested. Our first-principles calculations show that the proposed magnetic state is indeed more favorable than all possible magnetic solutions describable by the classical Heisenberg model including interactions between neighbors of arbitrary distance. We find that the $3d-5d$ hybridization between the Fe ML and the Ir substrate plays a key role for the unusual magnetic behavior.
[1] A.Kubetzka *et al.*, Phys. Rev. Lett. **94**, 087204 (2005).

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