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Helical spin order in Fe nanoislands SOO-HYON PHARK, Center for Correlated Electron Systems, Institute for Basic Science, Seoul National University, Seoul, Korea, KOHJI NAKAMURA, Department of Physics Engineering, Mie University, Japan, JAISON FISCHER, MARCO CORBETTA, SAFIA OUAZI, DIRK SANDER, JUERGEN KIRSCHNER, Max-Planck-Institute of Microstructure Physics, Halle, Germany — We report a spin-polarized scanning tunneling microscopy and spectroscopy (SP-STM/S), with an atomic scale resolution, of individual nanostructures of biatomic-layer-high Fe on Cu(111). SP-STM/S of the Fe nanoislands reveals a magnetic stripe phase with a period of 1.28 nm, which is identified as a one-dimensional helical spin order [1]. *Ab initio* calculations identify reduced-dimensionality-enhanced long range antiferromagnetic interactions as the driving force of this spin order, whereas the contribution of the spin-orbit coupling is negligible. In addition, energy-resolved SP-STS mapping provide a spatially-resolved and spin-dependent electronic structure of this helical spin order. The wave vector describing the spin order remains constant in the energy range –0.8 to +0.6 eV, whereas the spin contrast shows dissipation features around and sign change across the Fermi energy. We discuss the results in view of an energy gap opening associated with the non-collinear spin order. Our result identifies a novel aspect of SP-STM/S to characterize complex spin order with respect to the corresponding spin-dependent electronic band structure.

[1] S. Phark et al., *Nat. Commun.* 5 DOI: 10.1038/ncomms6183 (2014).

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