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In-plane anisotropy of Fe atoms on Bi_2Se_3(111) T. WEHLING, A. LICHTENSTEIN, 1. Institut für Theoretische Physik I, Universität Hamburg, Germany, J. HONOLKA, S. STEPANOW, K. KERN, Max-Planck-Institut für Festkörperforschung, Stuttgart, Germany, V. SESSI, N. BROOKES, ESRF, Grenoble, France, J. MI, B.B. IVERSEN, P. HOFMANN, iNANO, Aarhus University, Denmark, A.A. KHAJETOORIANS, J. WIEBE, T. SCHLENK, R. WIESENDANGER, Institute for Applied Physics, Universität Hamburg, Germany — Topological insulators exhibit a linearly dispersing gapless topological surface state where both the spin and momentum degrees of freedom are locked. The topological nature of this state results in interesting effects such as suppression of back-scattering. Recently, the robustness of these surface states against magnetic order has come under heavy investigation. Here, we explore the magnetic properties of single Fe adatoms on the Bi2Se3 surface, in the coverage range $< 1\%$, with combined non-local x-ray magnetic circular dichroism techniques and local low temperature scanning tunneling spectroscopy. We reveal that the adatoms heavily relax into the surface and exhibit a magnetic easy axis within the surface-plane, contrary to recent reports. Furthermore, we demonstrate, using $ab-initio$ approaches, how the easy axis can reorient from out-of-plane to in-plane when considering the interplay of Coulomb interactions, spin-orbit coupling, and dynamic hybridization effects.

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