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Experimental characterization and simulation of quasi-particle-interference in the Bi-bilayer topological insulator A. EICH, Institute of Applied Physics, University of Hamburg, Germany, M. MICHIARDI, iNano, Aarhus University, Denmark, G. BIHLMAYER, Peter Gruenberg Institute, Forschungszentrum Juelich, Germany, A.A. KHAJETOORIANS, J. WIEBE, Institute of Applied Physics, University of Hamburg, Germany, J.-L. MI, B.B. IVERSEN, PH. HOFMANN, iNano, Aarhus University, Denmark, R. WIESENDANGER, Institute of Applied Physics, University of Hamburg, Germany — Topological insulators are a new class of materials with a gapless surface state where spin and momentum are locked. A Bi-bilayer is predicted to be a 2D-topological insulator and well suited for scanning probe techniques that can be utilized to probe the topological edge states. Unfortunately there are only a few substrates that allow the growth of Bismuth in the rhombohedral structure, which is essential for the formation of the bilayer. Here we present a combined experimental and theoretical study of the quasi-particle interference (QPI) in the Bi-bilayer grown on the 3D-topological insulator Bi_2Se_3. Fourier-transform-scanning-tunneling-spectroscopy reveals additional features in QPI in comparison to a bare Bi_2Se_3 surface, indicating the development of new surface states below and above the Fermi energy. Via a comparison of measured QPI-patterns and simulated QPI-patterns based on DFT calculations, the bands participating in electron scattering are identified. DFT calculations further reveal a large influence of the bilayer-substrate-distance on the resulting band structure.

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