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A combined experimental and theoretical study of Rashba-split surface states on the $(\sqrt{3} \times \sqrt{3})$ **Pb/Ag(111)**$R30^\circ$ **surface** MATTHIAS BODE, LYDIA EL-KAREH, Physikalisches Institut, Experimentelle Physik II, Universität Würzburg, Germany, ARNE BUCHTER, HENDRIK BENTMANN, FRIEDRICH REINERT, Physikalisches Institut, Experimentelle Physik VII, Universität Würzburg, Germany, STEFAN BLÜGEL, GUSTAV BIHLMAYER, Peter Grünberg Institut and Institute of Advanced Simulation, Forschungszentrum Jülich and JARA, Germany — We report on a combined low-temperature scanning tunneling spectroscopy (STS), angle-resolved photoemission spectroscopy (ARPES), and density functional theory (DFT) investigation of the $(\sqrt{3} \times \sqrt{3})R30^\circ$ Pb/Ag(111) surface alloy which provides a giant Rashba-type spin-splitting. With STS we observed spectroscopic features that are assigned to two hole-like Rashba-split bands in the unoccupied energy range. By means of STS and quantum interference mapping we determine the band onsets, splitting strengths, and dispersions for both bands. The unambiguous assignment of scattering vectors is achieved by comparison to ARPES measurements. While intra-band scattering is found for both Rashba bands, inter-band scattering is only observed in the occupied energy range. Spin- and orbitally-resolved band structures were obtained by DFT calculations. Considering the scattering between states of different spin- and orbital character, the apparent deviation between experimentally observed scattering events and the theoretically predicted spin polarization could be resolved.

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