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Bi_1Te_1: A New Dual Topological Insulator LUKASZ PLUCINSKI, M. ESCHBACH, M. LANIUS, C. NIU, E. MLYNCZAK, P. GOSPODARIC, Peter Gruenberg Institute, FZ Juelich, Germany, J. KELLNER, II. Institute of Physics B, RWTH Aachen, Germany, P. SCHUEFFELGEN, M. GEHLMANN, S. DOERING, E. NEUMANN, Peter Gruenberg Institute, FZ Juelich, Germany, M. LUYSBERG, Peter Gruenberg Institute and ER-C, FZ Juelich, Germany, B. HOLLAENDER, G. MUSSLER, Peter Gruenberg Institute, FZ Juelich, Germany, M. MORGENSTERN, II. Institute of Physics B, RWTH Aachen, Germany, D. GRUETZMACHER, G. BIHLMAYER, S. BLUEGEL, C. M. SCHNEIDER, Peter Gruenberg Institute, FZ Juelich, Germany — We present, a combined theoretical and experimental study on the prediction and verification of the dual topological insulating character of the stoichiometric natural superlattice phase Bi_1Te_1 = $[Bi_2]_1[Bi_2Te_3]_2$ [1]. We identify Bi_1Te_1 by density functional theory to exhibit a non-trivial time-reversal symmetry-driven character of Z_2 = (0; 001) and additionally a mirror-symmetry induced mirror Chern number of v_M = -2, which indicates that Bi_1Te_1 is both a weak topological insulator (WTI) and a topological crystalline insulator (TCI). The coexistence of the two phenomena preordain distinct crystal planes to host topological surface states that are protected by the respective symmetries. We confirm the stacking sequence of our MBE-grown Bi_1Te_1 thin films by X-ray diffraction and transmission electron microscopy (STEM), and find clear indications of the TCI and WTI character in the surface spin electronic structure by spin- and angle-resolved photoemission spectroscopy. [1] M. Eschbach et al., arXiv:1604.08886 (2016).

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