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The full 3D electronic band structure of MgB2 determined by soft x-ray ARPES YASMINE SASSA, MARTIN MANSSON, Laboratory for Solid State Physics, ETH Zurich, CH-8093 Zurich, Switzerland, BASTIAN M. WOJEK, Materials Physics, Royal Institute of Technology KTH, S-16440 Kista, Sweden, MASAKI KOBAYASHI, Swiss Light Source, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland, OLOF GOTBERG, Materials Physics, Royal Institute of Technology KTH, S-16440 Kista, Sweden, VLADIMIR STROCOV, Swiss Light Source, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland, NIKOLAI ZHIGADLO, Laboratory for Solid State Physics, ETH Zurich, CH-8093 Zurich, Switzerland, OSCAR TJERNBERG, Materials Physics, Royal Institute of Technology KTH, S-16440 Kista, Sweden, BERTRAM BATLOGG, Laboratory for Solid State Physics, ETH Zurich, CH-8093 Zurich, Switzerland — MgB_2 is a prototypical multi-band multi-gap superconductor with electron-phonon coupling driving T_c up to 40 K. Surprisingly, the experimental knowledge of the electronic band structure is rather limited. Here, we present the first results of angle-resolved photoelectron spectroscopy (ARPES) studies on high quality MgB_2 single crystals, employing photons in the soft x-ray range with variable energy. We have been able to measure the band dispersion not only in the k_x-k_y plane, but also probe in detail the k_z dependence and thus, the 3D nature of the bands. Furthermore, we have found the ARPES intensities to be strongly polarization dependent and their analysis provides an excellent agreement with the orbital nature of the electronic states. The calculated electronic band structure captures very well all the features revealed in our experiment.

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