Spin-induced Symmetry Breaking of the Electronic Structure of CaFe$_2$As$_2$ Qiang Wang, Zhe Sun, Eli Rotenberg, Filip Ronning, Eric Bauer, Hsin Lin, Robert Markiewicz, Matti Lindroos, Bernardo Barbiellini, Arun Bansil, Daniel Dassau — Neutron scattering experiments have shown that the ground state of undoped Fe-As compounds exhibits collinear magnetic structure, namely, FM coupling and AFM coupling exist simultaneously along the orthogonal Fe-Fe bonds. However, the corresponding electronic structure is still a mystery. Using ARPES, we measured the low-temperature antiferromagnetic (AFM) phase of high quality crystals of CaFe$_2$As$_2$. We found that, consistent with collinear magnetic structure, the electronic structure exhibits symmetry breaking along the orthogonal Fe-Fe bonds. This is also consistent with the LDA calculation. We also found that FM coupling and AFM coupling results in exotic band dispersions perpendicular to the Fe-As layers. These properties shed light on the true band structure of undoped Fe-As compounds and are indispensable for the study of superconductivity and paring mechanism in Fe-As superconductors.

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