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Interface magnetic and orbital reconstruction in an oxide multiferroic $BiFeO_3$/ferromagnet $La_{0.7}Sr_{0.3}MnO_3$ heterostructure PU YU, UCB, JUN-SIK LEE, BNL, SATOSHI OKAMOTO, ONL, MARTA ROSSELL, LBNL, MARK HUIJBEN, CHAN-HO YANG, QING HE, JIN-XING ZHANG, SEUNG-YEUL YANG, MICHELLE LEE, UCB, QUENTIN RAMASSE, ROLF ERNI, LBNL, YING-HAO CHU, NCTU, TW, DARIO ARENA, CHI-CHANG KAO, BNL, LANE MARTIN, UIUC, RAMAMOORTHY RAMESH, UCB — Heteroepitaxial complex oxide heterostructures have attracted much scientific attention because of the novel phenomena and functionalities that have been observed to arise at interfaces as a consequence of the interplay between the spin, charge and orbital degrees of freedom. Here we are exploring a model heterointerface in which all the degrees of freedom, namely spin, charge, lattice, and orbital, are operative. The multiferroic perovskite, $BiFeO_3$ (BFO) is chosen as the model system that embodies the interplay between these degrees of freedom. This is counterposed across the interface with a highly correlated magnetic oxide, namely the doped manganite $La_{0.7}Sr_{0.3}MnO_3$ (LSMO). We have discovered the emergence of a novel magnetic state (1.4 μ_B/Fe in the interface compared with only $\sim$0.02 μ_B/Fe in bulk) in the BFO interfacelayer. This surprisingly large magnetization is associated with the emergence of spin and electronic orbital reconstruction at the heterointerface.

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