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Charge Control of Interface Magnetization at Oxide Heterointerface[1] G. LUEPKE, X. MA, H. ZHAI, F. FANG, College of William and Mary, A. KUMAR, R.S. KATIYAR, S. DUSSAN, University of Puerto Rico, H.B. ZHAO, Fudan University, J.F. SCOTT, University of Cambridge — The complex oxide heterointerface is key to the development of emerging multiferroic and spintronic technologies with new functionality. Even so, direct characterization of the interfacial spin state is missing, which prevents further interpretation of the coupling between spin and other ordering parameters at such oxide heterointerfaces, and impedes the development of future interface-based devices. Here we use the interface-specific Magnetization-induced Second-Harmonic Generation (MSHG) technique to investigate the interfacial magnetic state of the multiferroic (MF) heterostructure PbZr0.52Ti0.48O3 / La0.67Sr0.33MnO3 (PZT/LSMO) and its dependence on the charge state. We observe a gradual transition from ferromagnetic (FM) to canted anti-ferromagnetic (AFM) phase in the first unit cell layer at the heterointerface with increasing hole doping. Moreover, the exchange coupling between interface and bulk is weak, independently of the carrier filling. Our results provide new insight into the interface spin system of MF heterostructures, and have implications for developing electric field control of spin switches and magnetic tunneling junctions.

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