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Observation of a Three-Dimensional Quasi-Long-Range Charge Order in $YBa_2Cu_3O_{7-x}/La_{0.7}Ca_{0.3}MnO_3$ Heterostructures THOMAS MION, JUNFENG HE, Boston College, PADRAIC SHAFER, Lawrence Berkeley National Laboratory, VU THANH TRA, National Chiao Tung University, QING HE, JIUNN-YUAN LIN, Lawrence Berkeley National Laboratory, YING-HAO CHU, Academia Sinica, ELKE ARENHOLZ, Lawrence Berkeley National Laboratory, RUIHUA HE, Boston College — Heterostructures with strong interfacial effects can exhibit novel physical properties non-existent in either of the constituent materials alone. In particular, striking phenomena are observed when materials with mutually incompatible order parameters are put together by interface control on the atomic level. $YBa_2Cu_3O_{7-x}/La_{0.7}Ca_{0.3}MnO_3$ (YBCO/LCMO) heterostructures, the combinations of a high temperature superconductor and a ferromagnet, have attracted much recent attention due to the strong modifications to the original properties of the constituent materials, including an orbital reconstruction at the interface and an unexpected persistence of the proximity effect between superconductivity and ferromagnetism significantly away from the interface. Here, we report a new electronic order in this system which competes with superconductivity. It is a three-dimensional quasi-long-range charge order, distinct from the recently observed two-dimensional charge order in bulk YBCO. Our finding contributes to establishing YBCO/LCMO) heterostructures as a unique material platform in which superconductivity, charge order and ferromagnetism coexist and interact with each other.

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