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Massive Dirac Fermion on the Surface of a Magnetically Doped Topological Insulator YULIN CHEN, SLAC National Accelerator Laboratory, JIUN-HAW CHU, JAMES ANALYTIS, ZHONGKAI LIU, KYUSHIRO IGARASHI, HSUEH-HUI KUO, XIAOLIANG QI, SUNG-KWAN MO, ROBERT MOORE, DONGHUI LU, MAKOTO HASHIMOTO, TAKAO SASAGAWA, SHOUCHENG ZHANG, IAN FISHER, ZAHID HUSSAIN, ZHI-XUN SHEN — Insulating massive Dirac fermion state is a novel state of topological insulators in which the massless surface Dirac fermion becomes massive due to the braking of time reversal symmetry. In this state a gap develops at the Dirac point, with the Fermi energy resides inside both the surface and bulk gaps. By introducing magnetic dopants into three dimensional topological insulator Bi_2Se_3 to break the time reversal symmetry, we successfully observed the formation of massive Dirac fermion on the surface, with the Dirac gap magnitude tunable by magnetic dopant concentration. Furthermore, by precise control of simultaneous magnetic and charge doping, we successfully position the Fermi level inside the Dirac gap, thus realizing the much sought after insulating massive Dirac fermion state. This discovery paves the way for realizing striking topological phenomena and testing profound theoretical predictions.

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