Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

ARPES Studies of Low-energy electronic structure of the strong spin-orbit semimetal $SrIrO_3$ YUEFENG NIE, PHILIP D.C. KING, HAOFEI WEI, MASAKI UCHIDA, JOHN HARTER, ERIC MONKMAN, DANIEL SHAI, DARRELL SCHLOM, KYLE SHEN, Cornell University — The similar energy scales of spin-orbit coupling and electron-electron correlation strength lead to exotic $J_{eff} = 1/2$ Mott insulating ground states for layered Ruddlesden-Popper 5d iridates, $Sr_{n+1}Ir_nO_{3n+1}$. A metal-insulator transition occurs upon increasing dimensionality from the two-dimensional layered Sr_2IrO_4 to the three-dimensional perovskite $SrIrO_3$. However, little is known about the electronic structure and nature of the metallic states in $SrIrO_3$. We synthesized epitaxial $SrIrO_3$ films on (001) LSAT substrates by molecular beam epitaxy and investigated their electronic structure using angle-resolved photoemission spectroscopy. We find an exotic semimetallic state comprised of massive hole-like bands, whose extrema are pinned very close to the chemical potential, and rapidly dispersive electron bands which dominate the transport. Intriguingly, the bandwidths of $SrIrO_3$ are smaller than in its Mott insulating counterpart Sr_2IrO_4, indicating that metal-insulator transitions in Ruddlesden-Popper iridates are not simply driven by band narrowing resulting from reduced dimensionality.

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Date submitted: 14 Nov 2012 Electronic form version 1.4