Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

High mobility electron gas in the surface vicinity of the cubic-perovskite $KTaO_3$ via Ar^+-irradiation SATOSHI HARASHIMA, SLAC National Accelerator Laboratory, The University of Tokyo, CHRIS BELL, YASUYUKI HIKITA, SLAC National Accelerator Laboratory, HAROLD Y. HWANG, SLAC National Accelerator Laboratory, Stanford University — $KTaO_3$ (KTO), like $SrTiO_3$ (STO), can be doped to create a high mobility perovskite oxide semiconductor. However, while the low dimensional electronic states of STO have attracted intense interest via spectroscopic [1,2] and transport [3] studies, analogous investigations in KTO have been limited. Of particular interest is the fact that the cubic crystal symmetry in KTO is preserved at low temperatures, in contrast to STO. Here we electron dope KTO via oxygen-vacancy formation by Ar^+-irradiation [4]. Below $T = 10$ K, the Hall mobility ($> 10^4$ cm^2/Vs) of the electrons is significantly higher than in previous studies of STO [4]. The angular dependence of the Shubnikov-de Haas oscillations indicates a Fermi surface without cubic symmetry, in contrast to that expected for bulk KTO. We discuss the possible origins of these data, including the formation of quantum well structures, the coexistence of surface and bulk electrons, and the suppression of cyclotron motion by finite size effects.

[1] A. F. Santander-Syro *et al.*, Nature **469**, 189 (2011).
[2] W. Meevasana *et al.*, Nat. Mater. **10**, 114 (2011).
[3] Y. Kozuka *et al.*, Nature **462**, 487 (2009).
[4] J. H. Ngai *et al.*, Phys. Rev. B **81**, 241307 (2010).

Satoshi Harashima
SLAC National Accelerator Laboratory, The University of Tokyo

Date submitted: 17 Nov 2011 Electronic form version 1.4