Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Electrostatic doping and hybrid carriers in graphene on a polar $SrTiO_3$ (111) surface: theoretical investigation DONGHAN SHIN, ALEXANDER A. DEMKOV, Univ of Texas, Austin — Doping graphene layers presents a difficult practical and fundamental problem. We consider theoretically, the possibility of electrostatic doping of graphene by the intrinsic field of a polar substrate. By way of example, density functional theory calculations are carried out for a graphene sheet placed on the (111)-oriented perovskite $SrTiO_3$ surface. We find that the Fermi surface moves well below the Dirac point of graphene, resulting simultaneously in a fast conducting channel in graphene, and a slow, large effective mass channel in the oxide surface. Electrostatic gating may allow one to explore peculiar states that, through the "no-crossing" reminiscent of polaritons, would represent a hybrid carrier that exists simultaneously in both materials. Importantly, in addition to the field doping, we identify a more "obvious" mechanism of doping through the contact potential difference, which may have wider applications in the doping of two-dimensional materials.

Donghan Shin
Univ of Texas, Austin

Date submitted: 11 Nov 2016 Electronic form version 1.4