Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Quantum and transport scattering times in graphene X. HONG, K. ZOU, J. ZHU, Department of Physics, Penn State University, A. POSADAS, J. HOFFMAN, C. H. AHN, Department of Applied Physics, Yale University — We study the quantum (τ_q) and transport (τ_t) scattering times of single layer graphene mechanically exfoliated on SiO_2 and polycrystalline $Pb(Zr,Ti)O_3$ (PZT) substrates. The PZT substrate exhibits a gating efficiency of $\sim 2\times10^{11}/\mathrm{cm}^2/\mathrm{V}_g(\mathrm{V})$, corresponding to a dielectric constant of $\sim$12. We extract τ_q from the magnetic field dependence of Shubnikov de Haas oscillations and τ_t from the zero field mobility, respectively. For the PZT-gated graphene, in the density range of $2 \times 10^{12}/\mathrm{cm}^2 < n < 6 \times 10^{12}/\mathrm{cm}^2$, the transport scattering time τ_t exhibits a clear crossover from a $n^{1/2}$ dependence to a very weak density dependence at $\sim 4 \times 10^{12}/\mathrm{cm}^2$. This observation is consistent with the theoretical prediction of a transition from long to short- ranged impurity scattering in graphene [1]. On the other hand, the quantum relaxation time τ_q shows a $n^{1/2}$ dependence for the whole carrier density range. The ratio τ_t/τ_q changes from 2.5 to 1.8. Similar measurements are carried out on SiO_2-gated graphene. We compare data obtianed from both substrates. 1. E. H. Hwang and S. Das Sarma, PRB 77, 195412 (2008).

X. Hong
Department of Physics, Penn State University

Date submitted: 21 Nov 2008 Electronic form version 1.4