Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

The effect of a velocity barrier on the ballistic transport of Dirac fermions[1] ANDRES CONCHA, ZLATKO TESANOVIC, Johns Hopkins University — We propose a novel way to manipulate the transport properties of massless Dirac fermions by using velocity barriers, a region in which the Fermi velocity, v_F, has a value that differs from the one in the surrounding background. We find that the transmission through a velocity barrier is highly anisotropic, and that perfect transmission always occurs at normal incidence. We also analyzed consequences of such a barrier on the conductivity and Fano factors in the wide ribbon limit, and show that its effects should be easily mesurable with current available technology. Remarkably, when v_F in the barrier is larger that the velocity outside the barrier, we find that a critical transmission angle exists, a Brewster-like angle for massless Dirac electrons. The later being the basic element to construct electron waveguides and related devices.

[1]Research supported in part by the DOE under Grant No. DE-FG02-08ER46544.

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Date submitted: 20 Nov 2009 Electronic form version 1.4