Abstract Submitted
for the APR14 Meeting of
The American Physical Society

Limits on GeV-scale WIMPs using charge signals in XENON100
RICHARD WALL, Rice University, XENON100 COLLABORATION — Various theoretical models and recent experimental results have led to growing interest in the search for WIMP-like dark matter in the mass range of a few GeV. One important class of detector used in this study is based on the liquid-gas, dual-phase Xenon time projection chamber (as in XENON100 and LUX). These detectors nominally use both scintillation (S1) and ionization (S2) signals to localize collision events in their sensitive volumes and thus reject background events, but it is known that the efficiency for detecting small S1 signals (such as are expected from a GeV-scale WIMP interaction) is much smaller than the efficiency for detecting an S2 from the same recoil. By removing the requirement of an observed S1 signal, one can thus effectively lower the energy threshold of the detector, and study GeV-scale WIMPs with greater sensitivity. With this in mind, we measure the rate of WIMP candidates in 225 live days of XENON100 data in events with small S2 signals (with or without an accompanying S1) and which pass other simple selection cuts optimized for GeV-scale WIMPs. This rate is then used to set a limit on the WIMP-nucleon cross-section for the mass range 1-10 GeV.

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Date submitted: 10 Jan 2014 Electronic form version 1.4