Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Charge carrier velocity distribution in amorphous oxide field-effect transistors CHEN-GUAN LEE, BRIAN COBB, ANANTH DODABALAPUR, University of Texas at Austin — Charge transport in field-effect transistors (FETs) and the underlying physical mechanisms have been the subjects of numerous studies. Many types of transistors have been studied utilizing organic/polymer, amorphous silicon, and thin-film inorganic active layers. Most of these studies involve the evaluation of charge carrier mobility from steady-state characteristics as a function of temperature, electric field, channel dimensions, etc. In this study, we describe a technique to measure the velocity distribution of charge carriers in a thin-film transistor. We use this technique to evaluate velocity distributions in zinc-tin oxide (ZTO) thin-film transistors at various temperatures. In ZTO FETs, we observe multiple distinct transport pathways, each with a distinct activation energy. In contrast, steady state measurements yield a single activation energy. This shows that new insights into charge transport mechanisms and phenomena can be obtained with such time-resolved transport measurements which are not possible with steady-state approaches.

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Date submitted: 29 Dec 2010 Electronic form version 1.4