Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Direct Determination of Energy Level Alignment and Charge Transport at Metal/Alq_3 Interfaces via Ballistic-Electron-Emission Spectroscopy (BEES) J.S. JIANG, J.E. PEARSON, S.D. BADER, Argonne National Laboratory — In organic electronic devices, the difference between the electrode work function and the organic lowest unoccupied molecular orbital (LUMO) or highest occupied molecular orbital (HOMO) is a crucial parameter in determining the nature of charge transport. However, experimental determination of LUMO is challenging.[1] For the archetypal electroluminescent organic semiconductor tris-(8-hydroxyquinoline) aluminum (Alq_3), various techniques gave significantly different HOMO-LUMO gap values.[2] Using BEES, we directly determined the energy barrier for electron injection at clean interfaces of Alq_3 with Al and Fe to be 2.1 eV and 2.2 eV, respectively. We quantitatively modeled the sub-barrier BEES spectra with an accumulated space charge layer, and found that the transport of non-ballistic electrons is consistent with random hopping over the injection barrier. Supported by U.S. DOE Office of Science Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.

[1]J. C. Scott, J. Vac. Sci. Tech, A **21**, 521 (2003).
[2]I. H. Campbell, D. L. Smith, Appl. Phys. Lett. **74**, 561 (1999); I. G. Hill *et al.* Chem. Phys. Lett. **327**, 181 (2000); S. F. Alvarado *et al.* IBM J. Res. Dev. **45**, 89 (2001).

J. Jiang
Argonne National Laboratory

Date submitted: 14 Dec 2010 Electronic form version 1.4