Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Superconductivity Dependent Friction M. HIGHLAND, J. KRIM, North Carolina State University — In order to gain a fundamental understanding of friction, one must understand, at the molecular level, how the energy associated with the work to overcome friction is converted to heat. One of the simplest possible geometries in which friction can occur, and thus be studied, is that of a fluid or crystalline monolayer adsorbed on an atomically flat surface. This geometry is experimentally accessible to experiments with a Quartz Crystal Microbalance (QCM), to numerical simulation techniques, and to analytic theory. A prior QCM experiment [1] sought to explore the nature of electronic contributions to friction by measuring the friction associated with nitrogen monolayers sliding on Pb substrates, that had been exposed to air, as the temperature passed through the superconducting transition at 7.2K. The work inspired a number of subsequent theoretical and experimental efforts, which yielded contradictory results. We have repeated these measurements on Pb substrates that were prepared *in situ* for nitrogen and water films. We have observed the functional form of the rapid but smooth change in friction between nitrogen slipping on Pb near T_c. We have also observed a wider temperature range of frictional effects as compared to bulk changes in resistivity. We present these results and compare them to previous observations of superconductivity-dependent friction. [1] A. Dayo, W. Alnasrallah and J. Krim, Phys. Rev. Lett. vol 80, 1690 (1998); Work funded by NSF.

Matt Highland
North Carolina State University

Date submitted: 01 Dec 2004 Electronic form version 1.4