Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Thermal Resistance at the Liquid-Solid Interface ALI BESKOK, BO HUNG KIM, Old Dominion University, TAHIR CAGIN, Texas A&M University — Heat conduction between parallel plates separated by a thin layer of liquid Argon is investigated using three-dimensional MD simulations employing 6-12 Lennard-Jones potential interactions. Channel walls are maintained at specific temperatures using a recently developed interactive thermal wall model. Heat flux and temperature distribution in nano-channels are calculated for channel heights varying from 12.96 nm to 3.24 nm. Fourier law of heat conduction is verified for the smallest channel, while the thermal conductivity obtained from Fourier law is verified using the predictions of the Green-Kubo theory. Temperature jumps at the liquid/solid interface, corresponding to the well known Kapitza resistance, are observed. Using systematic studies thermal resistance length at the interface is characterized as a function of the surface wettability, thermal oscillation frequency, wall temperature, thermal gradient and channel height. An empirical model for the thermal resistance length, which could be used as the jump-coefficient of a Navier-type boundary condition, is developed.

Ali Beskok
Old Dominion University

Date submitted: 08 Jul 2008 Electronic form version 1.4