Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Cold Water Jets on a Hot Si surface JI YONG PARK, CHANG-KI MIN, DAVID CAHILL, STEVE GRANICK, Department of Materials Science and Engineering, University of Illinois — We are using a femtosecond pump-probe apparatus to study heat transfer when a pulsed jet of liquid water impinges on a hot Pt-coated Si surface (Leidenfrost Effect). The light source in the experiment is a 100 mW Er:fiber laser operating at a wavelength of λ=1550 nm; the total volume of the pulsed water jet is $\sim$0.9 mm^3. The temperature change within the Si substrate at a distance of 50 microns from the interface is measured by a novel time-resolved thermometry based on two-photon absorption. We measure the thermal conductance of the water layer within 50 nm of the interface by time-domain thermo-reflectance; changes in the thermal conductance provide a direct measurement of the contact time of the liquid. We convert the integral of the temperature excursion to the energy transferred using a Green's function solution of heat conduction in the Si substrate. Both the energy transferred and contact time show a smooth evolution from high values at 110C to low values at 210C without any clear indication of a Leidenfrost point.

Ji Yong Park
Department of Materials Science and Engineering, University of Illinois

Date submitted: 15 Nov 2009 Electronic form version 1.4