

Abstract Submitted  
for the HAW09 Meeting of  
The American Physical Society

**Heavy-quark free energy at finite temperature in full-QCD lattice simulations** YU MAEZAWA, En'yo Radiation Laboratory, Nishina Accelerator Research Center, RIKEN, SHINYA AOKI, University of Tsukuba, SHINJI EJIRI, Brookhaven National Laboratory, TETSUO HATSUDA, NORIYOSHI ISHII, University of Tokyo, KAZUYUKI KANAYA, HIROSHI OHNO, University of Tsukuba, TAKASHI UMEDA, Hiroshima University, WHOT-QCD COLLABORATION — We present recent results of free energies between a heavy quark and antiquark at finite temperature in 2+1 flavors lattice simulations. We perform simulations on  $32^3$  times 16–4 lattices in fixed scale approach with 2+1 flavors of improved Wilson quark action, and extract static quark free energies from Polyakov-line correlations projected to a color-singlet channel in the fixed Coulomb gauge. As interesting results, at short separation, magnitude of the heavy-quark free energies for any temperatures converges to that of a heavy-quark potential calculated from the Wilson-loop at zero temperature. This suggests that the renormalization is common for all temperature in the fixed scale approach. We also show properties of the Debye screening mass at long separation and discuss dynamical quark effect from comparison with previous studies in two-flavors and quenched QCD simulation.

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Date submitted: 30 Jun 2009

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