

Acceptance ratios of Monte Carlo simulations with local updates

Veniamin Blinov^b, Evgeni Burovski^{a,b}, Wolfhard Janke^c, Maria Guskova^{a,b}, Lev Shchur^{a,b}

^a *National Research University Higher School of Economics, 101000 Moscow, Russia*

^b *Science Center in Chernogolovka, 142432 Chernogolovka, Russia*

^c *Institut für Theoretische Physik, Universität Leipzig, Postfach 100 920, 04009 Leipzig, Germany*

We study acceptance ratios of local updates in Monte Carlo simulations of classical spin models. We derive analytic expressions for the expected value of the acceptance ratios of Metropolis and heat bath updates for a one-dimensional Ising model, and find that for the Metropolis updates, the mean value of the acceptance ratio is a linear function of the energy; for the heat bath algorithm, the dependence is close to linear outside of the low temperature range. These analytic expressions are corroborated by numeric simulations. We also report results of numeric simulations of related classical spin models: the two-dimensional Ising model, one- and two-dimensional three- and four-state Potts models, and one- and two-dimensional XY model.