Density Fluctuations as Signature of a Non–Equilibrium First Order Phase Transition

C. Sasaki[a], **B. Friman**[b] and **K. Redlich**[c]

[a]Physik-Department, Technische Universität München,
D-85747 Garching, Germany, *csasaki@ph.tum.de*

[b]GSI, D-64291 Darmstadt, Germany, *b.friman@gsi.de*

[c]Institute of Theoretical Physics, University of Wroclaw,
PL–50204 Wrocław, Poland, *redlich@ift.uni.wroc.pl*

Fluctuations of conserved charges have been proposed as probes of the QCD phase transition [1-2]. In particular, large fluctuations of the net baryon number and electric charge are expected at the critical end point (CEP) in the QCD phase diagram [2]. Consequently, a non-monotonic dependence of these fluctuations on $\sqrt{s}$ has been proposed as a signature for the CEP in heavy ion collisions [1-2].

In this talk we argue, that the fluctuations at the QCD phase transition are modified if the system is out of equilibrium [3]. Within a chiral model we show that, in the presence of spinodal instabilities which develop at the 1st order phase transition, the fluctuations of conserved charges can be as strong as those at the CEP. In particular, along the isothermal spinodal lines of the first order chiral phase transition, the net quark number susceptibility diverges. The critical exponents of this singularity are discussed in Ginsburg-Landay theory. We find that charge density fluctuations can be used not only to probe the CEP but also the non–equilibrium first order chiral phase transition in heavy ion collisions [3].

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