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Entropy Production at the Chiral Phase Transition

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We propose an increased entropy production as a characteristic signal for a first-order chiral phase transition to be observed in heavy-ion collisions. Assuming a simple Bjorken description for the central region of the produced fireball, we study the evolution of the expanding medium using a spatially homogeneous fluid and a time-dependent order parameter σ. We solve the equation of motion for σ coupled to the equations of Bjorken hydrodynamics to describe evolutions through the first-order phase transition, critical endpoint, and crossover region of the linear sigma model. We observe an increase of the total entropy of roughly 10-20% around the phase transition, which is larger for a first-order transition than for a continuous crossover or critical endpoint. Relating the entropy to the number of produced particles, we suggest to search for an increase in pion multiplicity at the upcoming FAIR facility.

Primary authors: Mr KITTIRATPATTANA, Apiwit (Suranaree University of Technology);   Dr HEROLD, Christoph (Suranaree University of Technology)

Co-authors: Dr STEINHEIMER, Jan;   Prof. BLEICHER, Marcus (Uni Frankfurt);   LIMPHIRAT, Ayut (Suranaree University of Technology (TH));   KOBDAJ, Chinorat (Suranaree University of Technology (TH));   Prof. YAN, Yupeng (Suranaree University of Technology)

Presenter: Mr KITTIRATPATTANA, Apiwit (Suranaree University of Technology)

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