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.

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