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# Reaction−diffusion equations in ultra−high energy heavy−ion and pp collisions: Effective first order quark−hadron transition and DCC formation

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Reaction-diffusion equations with suitable boundary conditions have special propagating solutions which very closely resemble the moving interfaces in a first order transition. We show that the dynamics of chiral order parameter in heavy-ion collisions, with dissipative dynamics, is governed by one such equation, specifically, the Newell-Whitehead equation. The chiral transition is, therefore, completed by a propagating interface, exactly as for a first order transition, even though the transition actually is a crossover for relativistic heavy−ion collisions. Same thing also happens when we consider the initial confinement−deconfinement transition with Polyakov loop order parameter. We next consider the case of high multiplicity pp collisions at LHC energy where a transient stage of quark-gluon plasma, where chiral symmetry is restored, may be achieved. We study the dynamics of chiral field for such an event using reaction−diffusion equation approach and show that the interior of such a rapidly expanding system is likely to lead to the formation of a single large domain of disoriented chiral condensate (DCC).

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