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Disoriented isospin condensates in high energy heavy ion collisions (online)

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Fluctuations between charged and neutral kaons measured by the ALICE Collaboration in Pb-Pb collisions at the LHC exceed conventional explanations. Previously it was shown that if the scalar condensate is accompanied by an electrically neutral isospin–1 field then the combination can produce large equilibrium fluctuations where $\langle \overline{u}u \rangle \neq \langle \overline{d}d \rangle$. Hadronizing strange and anti-strange quarks might then strongly fluctuate between charged ($u\overline{s}$ or $s\overline{u}$) and neutral ($d\overline{s}$ or $s\overline{d}$) kaons. Here we estimate the times for the condensates to achieve their equilibrium probability distributions within causal volumes in high energy heavy ion collisions. This is achieved by modeling the temperature dependence of the condensates, mesonic collective excitations, decay rates of the associated fields, and employing the Langevin and Fokker-Planck equations. We find that the equilibration times are short compared with the expan- sion time, and therefore disoriented isospin condensates are a viable explanation for the anomalous fluctuations observed at the LHC.

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