Contribution ID: **27**   Type: **Poster presentation**

Stability of Classical Chromodynamic Fields

A system of gluon fields generated at the earliest phase of relativistic heavy-ion
collisions can be described in terms of classical fields. Numerical simulations show that the system is unstable but a character of the instability is not well understood. With the intention to systematically study the problem, we analyze a stability of classical chromomagnetic and chromoelectric fields which are constant and uniform. We consider the Abelian configurations discussed in the past where the fields are due to the single-color potentials linearly depending on coordinates. However, we mostly focus on the nonAbelian configurations where the fields are generated by the multi-color non-commuting constant uniform potentials. We derive a complete spectrum of small fluctuations around the background fields which obey the linearized Yang-Mills equations. The spectra of Abelian and nonAbelian configurations are similar but different and they both include unstable modes. We briefly discuss the relevance of our results for fields which are uniform only in a limited spatial domain.

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Session Classification: Poster session