Contribution ID : **224** Type : **Plenary/section talk**

Geometrical clusterization of Polyakjov loops in SU(2) lattice gluodynamics

Thursday, 13 October 2016 16:05 (20)

The liquid droplet formula is applied to an analysis of the properties of geometrical (anti)clusters formed in SU(2) gluodynamics by the Polyakov loops of the same sign. Using this approach, we explain the phase transition in SU(2) gluodynamics as a transition between two liquids during which one of the liquid droplets (the largest cluster of a certain Polyakov loop sign) experiences a conden-sation, while another droplet (the next to the largest cluster of the opposite sign of Polyakov loop) evaporates. The clusters of smaller sizes form two accompanying gases, which behave oppositely to their liquids. The liquid droplet formula is used to analyze the size distributions of the gas (anti)clusters. The fit of these distributions allows us to extract the temperature dependence of surface tension and the value of Fisher topological exponent for both kinds of gaseous clusters. It is shown that the surface tension coefficient of gaseous (anti)clusters can serve as an order parameter of the deconfinement phase transition in SU(2) gluodynamics. The Fisher topological exponent of (anti)clusters is found to have the same value 1:806 0:008. This value disagrees with the famous Fisher droplet model, but it agrees well with an exactly solvable model of nuclear liquid-gas phase transition. This finding may evidence for the fact that the SU(2) gluodynamics and this exactly solvable model of nuclear liquid-gas phase transition are in the same universality class.

Kewords: geometrical clusters, size distributions, liquid droplet model formula, surface tension

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Session Classification : Nuclear physics and particle physics - parallel VII

Track Classification : Heavy ion