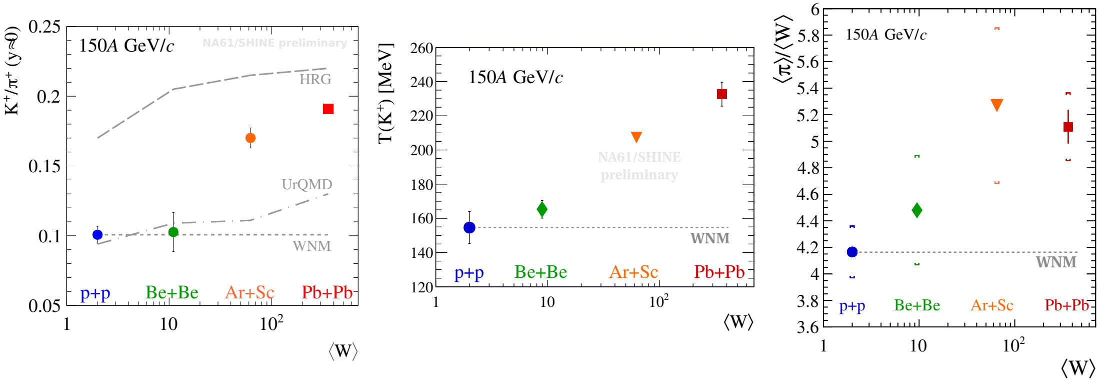
Onset of fireball - mean multiplicities and spectra

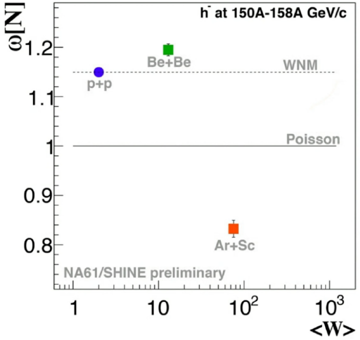
A+A collisions at 150 A GeV/c ($\sqrt{s_{NN}} \approx 17.2$ GeV)

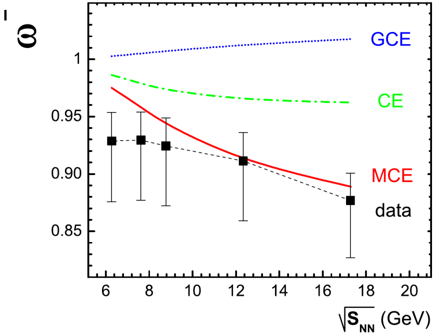


Phys. Rev. C99 (2019) 3, 034909

Onset of fireball - fluctuations

A+A collisions at 150 A GeV/c ($\sqrt{s_{NN}} \approx 17.2$ GeV)





Phys. Rev. C76 (2007) 024902

Pb+Pb (NA49)

in somewhat smaller acceptance

Theoretical approaches

- **The percolation approach** - assumes that with increasing nuclear mass number to form a large clusters by overlapping many elementary clusters may rapidly increase with A, the behaviour typical for percolation models.
  (G. Baym, Physica A 96 (1979) 131–135; T. Celik, F. Karsch, H. Satz, Phys. Lett. 97B (1980) 128–130; M. Braun, C. Pajares, Nucl. Phys. B390 (1993) 542–558; N. Armesto, M. A. Braun, E. G. Ferreiro, C. Pajares, Phys. Rev. Lett. 77 (1996) 3736–3738; L. Cunqueiro, E. G. Ferreiro, F. del Moral, C. Pajares, Phys. Rev. C72 (2005) 024907)
- **AdS/CFT correspondence** - assumes that only starting from a sufficiently large nuclear mass number the formation of the trapping surface in A+A collisions is possible.
  (J. M. Maldacena, Int. J. Theor. Phys. 38 (1999) 1113–1133; E. Shuryak, Prog. Part. Nucl. Phys. 62 (2009) 48–101; S. Lin, E. Shuryak, Phys. Rev. D79 (2009) 124015)

Invitation for discussion

Self-interacting QCD strings and string balls

Tigran Kalaydzhyan and Edward Shuryak
Department of Physics and Astronomy, Stony Brook University,
Stony Brook, New York 11794-3800, USA
(Dated: August 3, 2018)

Strings at $T \approx T_c$ are known to be subject to the so-called Hagedorn phenomenon, in which a string's entropy (times T) and energy cancel each other and result in the evolution of the string into highly excited states, or "string balls". Intrinsic attractive interaction of strings – gravitational for fundamental strings or in the context of holographic models of the AdS/QCD type, or σ exchanges for QCD strings – can signif cantly modify properties of the string balls. If heavy enough, those start approaching properties of the black holes. We generate self-interacting string balls numerically, in a thermal string lattice model. We found that in a certain range of the interaction coupling constants they morph into a new phase, the "entropy-rich" string balls. These objects can appear in the so-called mixed phase of hadronic matter, produced in heavy ion collisions, as well as possibly in the high multiplicity proton-proton or proton-nucleus collisions. Among discussed applications are jet quenching in the mixed phase and also the study of angular deformations of the string balls.

Phys. Rev. D 90, 025031 (2014)