

# UNREASONABLE EFFECTIVENESS OF STATISTICAL APPROACHES TO HIGH-ENERGY COLLISIONS

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## ABSTRACT

This talk addresses the longstanding question of how statistical physics applies at the nano(femto) scale, a topic that emerged following the discovery of nucleation reactions in the early 1930s and was formalized by the introduction of “nano(femto)thermodynamics” as early as 2000. We examine the thermodynamic properties of small systems created in relativistic ion collisions, emphasizing the relevance of non-extensive statistics (as a special form of superstatistics) in describing multiparticle production in hadronic and nuclear interactions where fluctuations cannot be neglected. Finally, the connection between the nonextensivity parameter  $q$  and particle number fluctuations is explored, highlighting its significance in understanding these high-energy processes.

*Keywords:* high-energy collisions, multiparticle production processes, multiplicity fluctuations

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