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Enhancing the CERN LHC small systems program with bowling-pin-shaped neon isotopes

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We demonstrate the unique opportunities for small systems studies offered by complementing the future run of ^{16}O+^{16}O collisions at the CERN LHC with collisions of bowling-pin-shaped ^{20}Ne isotopes.

1. Origin of collectivity: A comprehensive campaign of hydrodynamic calculations (~20 million simulated events) demonstrates that the impact of the extreme shape of neon on elliptic flow survives the large fluctuations due to the small nucleon numbers in the comparison O+O vs. Ne+Ne. Such modifications are robust against variations in hydrodynamic model parameters, and, if observed, will yield conclusive evidence of the geometric (and potentially hydrodynamic) origin of flow in systems presenting $dN/dy \approx 100$.

2. Energy loss in small systems: Due to the extremely elongated ^{20}Ne geometry, Ne+Ne collisions may help reveal hard-probe modification via path-length-dependent effects in the comparison with O+O collisions, without requiring a good centrality resolution. We estimate such effects based on the analysis of the path lengths expected to be traversed by the hard probes at realistic temperatures.

Based on Giacalone, Nijs, van der Schee, *et al.*, arXiv:2212:XXXXX

Experiment/Theory

Theory/Phenomenology

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