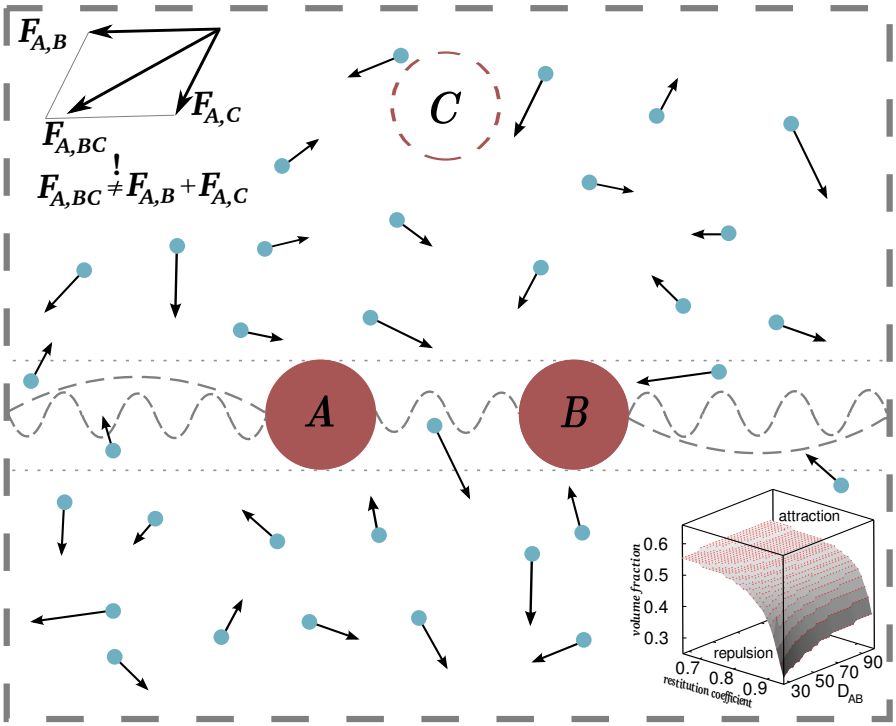
23rd MSS-Seminar

Wednesday, November 16th, 15:30, Nägelsbachstr. 49b

Long-range interactions in fluidized granular mixtures

Reza Shaebani

Department of Theoretical Physics, University of Duisburg-Essen



Effective long-range interactions between intruder particles immersed in a randomly driven granular fluid are investigated. The effective force F between two intruders, induced by the fluctuations of the hydrodynamic fields, is attractive when the volume fraction of the granular fluid is sufficiently high. However, a crossover from attraction to repulsion occurs as the volume fraction decreases. This behavior is explained by competing dynamical effects, resulting in a non-uniform collision distribution around the intruders. We present the phase diagram of the transition with three control parameters: the volume fraction, the distance between the intruders, and the restitution coefficient. Our results reveal that F is proportional to the steady-state temperature and grows logarithmically with increasing the system size in two dimensions. Moreover, by increasing the number of intruders, we verify that the fluctuation-induced interaction is not derived from a pair-potential. These results shed new light on the mechanisms of segregation in fluidized granular media.