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Stability of jammed systems to generalized boundary deformations[1] OLEG KOGAN, SAM SCHOENHOLZ, ANDREA LIU, University of Pennsylvania, SIDNEY NAGEL, University of Chicago, LIU GROUP, UNIV. OF PENNSYLVANIA COLLABORATION, NAGEL GROUP, UNIV. OF CHICAGO COLLABORATION — At zero temperature and applied stress, amorphous packings of repulsive spheres exhibit a jamming transition to rigidity. As pointed out by Torquato and Stillinger, some of these "collectively jammed" configurations may not be stable with respect to boundary deformations, while others, "strictly jammed," may be stable with respect to any change of the boundaries. We explore this by considering systems with periodic boundary conditions at packing fractions above the jamming transition as comprising the basis of an infinite square (or cubic) lattice. The displacement fields of particles corresponding to normal modes of vibration are generally not consistent with the periodic boundary conditions used to construct the basis packing. Therefore, by studying the vibrational modes we determine the linear response to boundary deformations that do not respect the periodicity of the initial system. Hence, we are able to explore the stability of packings with respect to a large class of boundary deformations. We discover that some configurations have modes with negative energies, indicating instability. We report the effects of system size and packing fraction upon the probability that a collectively jammed packing is also stable with respect to boundary deformations.

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