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Finite Size Effects at the Jamming Transition CARL GOODRICH, University of Pennsylvania, SIDNEY NAGEL, University of Chicago, ANDREA LIU, University of Pennsylvania — Packings of spheres at zero temperature and shear stress exhibit a jamming/unjamming transition as a function of density. For spheres that repel when they overlap and do not otherwise interact, packings are jammed with a nonzero static shear modulus when the density, ϕ, exceeds a critical density, ϕ_c. This jamming transition displays characteristics of both first and second order phase transitions with, for example, a discontinuous jump in the coordination number (average number of interacting neighbors per particle) and a power-law increase in the shear modulus. In addition, multiple length scales have been identified that diverge as ϕ decreases towards ϕ_c, emphasizing the second order nature of the transition. The existence of diverging length scales suggests that quantities such as the coordination number and shear modulus should exhibit finite size scaling as ϕ_c is approached, but until now this has not been observed. We report the first measurements of finite size scaling at the jamming transition of soft frictionless repulsive spheres and explore the implications of these results on our current understanding of the jamming transition.

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