Abstract Submitted
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Experimental Characterization of the Jamming Transition in a Granular Material[1] TRUSHANT MAJMUDAR[2], MIT, ROBERT BEHRINGER, Duke University — We describe experiments to test recent predictions for the jamming transition in disordered solids. Here, our system is a 2D granular material consisting of photoelastic disks. By observing these particles through crossed circular polarizers, it is possible to a) accurately determine particle contacts, b) via an appropriate computational procedure, calculate the vector contact forces between particles, and c) from the contact forces compute the Cauchy stress. Simulations (e.g. by O'Hern et al., Donev et al.) for frictionless particles predict a discontinuous increase in the contact number, Z at the jamming transition, given by a critical packing fraction, ϕ_c. Above jamming, Z should then increase as a power law in $\phi - \phi_c$ with an exponent of 0.5 to 0.6. The pressure, P is also predicted to grow as a power law. Additionally, Senkes and Chakraborty have predicted the behavior of P and Z using a meanfield entropy-based description. Our experiments support all of these predictions. There is a rapid increase in Z at ϕ_c, and power law increase of Z and P above the transition. There is also reasonable agreement between the data and the predictions of Senkens and Chakraborty.

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