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Fourth-order Fluctuations near the Colloidal Glass Transition CHRIS WAGENBACH, NATHAN ISRAELOFF, Northeastern University — Fourth-order statistical fluctuations are probed in order to determine the size of cooperative regions as the colloidal glass transition is approached. The experiment makes use of the electrical conductance of a colloidal fluid containing KCl measured through a micropore in a membrane placed in the colloid. The diameter of this micropore is adjusted to be at least ten times the diameter of the colloidal particles. The dynamics of the particles near and within the pore are revealed in the fluctuations of the conductance. For the largest particles, a polydisperse sample of 106 to 125 microns, the dynamics are driven by a mechanical shaking, while for the smaller particles, <10 microns, Brownian motion drives the dynamics. Using a spherical probe, we mapped the conductivity change near the pore which enabled us to determine that the effective volume for the fourth-order fluctuations was $\sim 1.5 D^3$, where D is the diameter of the membrane pore. Thus, near the glass transition at a volume fraction of .58, the number of particles probed is about 1700 which is small enough to see the growth of fourth-order fluctuations. It is hoped that this technique can be applied to very small, ∼100 nm, particles for which the cooperative length can be studied over a wide range of volume fractions.

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