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Divergence of the Long Wavelength Collective Diffusion Coefficient in Quasi-one and Quasi-two Dimensional Colloid Suspensions[1] BINHUA LIN, University of Chicago, BIANXIAO CUI, Stanford University, XINLIANG XU, MIT, RONEN ZANGI, Basque Foundation for Science, Spain, HAIM DIAMANT, Tel Aviv University, STUART A. RICE, University of Chicago — We report the results of experimental studies of the short time-long wavelength behavior of collective particle displacements in q1D and q2D colloid suspensions. Our results are reported via the q->0 behavior of the hydrodynamic function $H(q)$ that relates the effective collective diffusion coefficient, $D_e(q)$, with the static structure factor $S(q)$ and the self-diffusion coefficient of isolated particles D_o: $H(q)D_e(q)S(q)/D_o$. We find an apparent divergence of $H(q)$ as q->0 with the form $\mathrm{H(q)q^{-}}(1.7 < \gamma < 1.9)$, for both q1D and q2D colloid suspensions. Given that $S(q)$ does not diverge as we infer that $D_e(q)$ does. This behavior is qualitatively different from that of the three-dimensional $H(q)$ and $D_e(q)$ as q->0, and the divergence is of a different functional form from that predicted for the diffusion coefficient in one component 1D and 2D fluids not subject to boundary conditions that define the dimensionality of the system.

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