Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Local Packing Fraction Statistics in a Two-Dimensional Granular Media JAMES PUCKETT, FREDERIC LECHENAULT, KAREN DANIELS, North Carolina State University — We experimentally investigate local packing fraction statistics of a two-dimensional bidisperse granular material supported by a horizontal air table and rearranged under impulses from the boundary. Our apparatus permits investigation of dense liquids close to the jamming transition under either constant pressure (CP) or constant volume (CV) boundary conditions and three different coefficients of friction. We calculate the probability distribution of the local packing fraction ϕ using both radical Voronoi tessellations (ϕ_V) and the Central Limit Theorem (ϕ_{CLT}). The two distributions have the same mean: $\langle\phi_V\rangle = \langle\phi_{CLT}\rangle$. For both methods, we observe that the variance strictly decreases as the mean increases; the functional dependence reveals information about the system. The variance of ϕ_V is larger under CP than CV, as expected since the cell volumes adjust to fluctuations in global volume. Interestingly, this feature is missing from ϕ_{CLT}. Instead, the variance of ϕ_{CLT} is sensitive to the internal friction of the system.

James Puckett
North Carolina State University

Date submitted: 20 Nov 2009 Electronic form version 1.4