Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Experimental determination of frictional families in small 2D granular[1] MARK D. SHATTUCK, Benjamin Levich Institute and Physics Department, City College of New York, JERZY BLAWZDZIEWICZ, COREY O'HERN, Departments of Mechanical Engineering and Physics, Yale University — We have developed a new experimental technique to explore the effects of friction in mechanically stable two-dimensional disk packings. The technique uses high frequency low amplitude vibration to relax tangential forces (friction) without significantly changing the normal forces. If short bursts (<10 ms) of vibration are used, the friction can be relaxed in steps. At each step the system reaches mechanical stability but from step to step the stability evolves from friction-dominated to an eventual final state that is stablized only by normal forces (frictionless). Using this protocol on a large random sample of frictional states we can determine the properties of frictional states. Previous experiments and simulations found that the *frictionless states* form a finite set of dilute points in configuration space. Our new study indicates that the *fictional states* form a finite number of families or low dimensional (usually one dimesional) branches that are connected to the frictionless points in configuration space. The branches and branch points are determined by the connectivity of the particle assembly, and the probability of the system being on a particular branch is not uniformly distributed for physical packing-generation protocols.

[1]NSF DMR-0934206, NSF DMS-0835742

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Date submitted: 07 Dec 2009 Electronic form version 1.4