Abstract Submitted
for the APR12 Meeting of
The American Physical Society

Some physical consequences of a random walk in velocity space CAROLINE HERZENBERG, Retired — A simple conceptual model of stochastic behavior based on a random walk process in velocity space is examined. For objects moving at non-relativistic velocities, this leads under asymmetric directional probabilities to acceleration processes that resemble the behavior of objects subject to Newton's second law. For three dimensional space, inverse square law acceleration emerges for sufficiently separated objects. In modeling classical behavior, such non-relativistic random walks would appear to be limited to objects of sufficiently large mass. Objects with smaller mass exhibit more rapid diffusion and less localization, and a relativistic random walk would seem to be required for objects having masses smaller than a threshold mass value. Results suggest that the threshold mass value must be similar in magnitude to the Planck mass, which leads to behavior somewhat comparable to that characterizing an intrinsic quantum classical transition in the microgram mass range.

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Date submitted: 05 Jan 2012 Electronic form version 1.4