962-37-144 **Kevin R Vixie*** (vixie@lanl.gov), Los Alamos National Laboratory, X-8, MS P365, Los Alamos, NM 87545, and **Gary Sandine** (sandine@lanl.gov), Los Alamos National Laboratory, X-8, MS P365, Los Alamos, NM 87545. *Reconstruction from Radiographic Projections using Dynamics: Non-Stochastic Case.*

The problem of determining three-dimensional density fields from single two-dimensional projections is hopelessly underdetermined without additional assumptions. While parameterized inversions are typically used to solve this problem, we present theoretical results along a different route to the elimination of indeterminacy. Suppose that we have a series of N radiographs measuring X-ray or proton attenuation through an evolving object at a sequence of times. Suppose also that we know the deterministic dynamical laws governing the evolution of the object we are probing with radiography. The these laws can be used to combine the radiographs into one "super"-measurement which can then be inverted to the object sequence. Now suppose the objects are points in R^n and the radiographs are points in R^d. It would be expected that the best we could do would be to get invertibility when N = $\lceil n/d \rceil$. The worst case is that we never get invertibility. We look at both cases carefully for linear dynamics. We show that dynamical laws giving this optimally short invertibility time are generic. We then illustrate with numerical examples and present a conjecture for the nonlinear case. (Received August 09, 2000)