Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Homogeneous Self-Dual Cones and the Structure of Quantum Theory ALEXANDER WILCE, Susquehanna University — This talk reviews recent and on-going work with Howard Barnum on the origins of the Jordan-algebraic structure of finite-dimensional quantum theory. I begin by surveying various principles — e.g., that every state of a bipartite system arise as the marginal of a "steering" bipartite state – - that force the cone of (un-normalized) states of a finite-dimensional probabilistic system to be homogenous and *weakly* self-dual, that is, isomorphic to its dual cone. Where this weak self-duality can be implemented by an inner product, the cone is *strongly* self dual. In this case, classical results of Koecher and Vinberg show that it is isomorphic to the cone of squares in a formally real Jordan algebra. If this is the case, then (using a theorem of H. Hanche-Olsen) one can show that the only locally-tomographic theory containing at least one qubit is finite-dimensional Complex QM. I conclude with a brief discussion of how one might motivate strong self-duality.

Alexander Wilce
Susquehanna University

Date submitted: 29 Dec 2010 Electronic form version 1.4