1086-81-2445 **Marco Lanzagorta*** (marco.lanzagorta@nrl.navy.mil), US Naval Research Laboratory, 4555 Overlook Ave. SW, Washington, DC 20375. *Group Theoretic Analysis of Relativistic Quantum Walks.* Preliminary report.

It is known that discrete-time quantum walks and relativistic quantum dynamics in 1+1 spacetime for spin-0 and spin-1/2 particles have a similar mathematical structure. However, there are many unanswered questions: is this a coincidence? What is the optimal extension to 4-D spacetime? Do the same similitude emerges for a spin-1 particle (e.g. a massless photon)? To provide a mathematical framework to answer these questions, it is important to recall that the Klein-Gordon (Spin-0), Dirac (spin-1/2), and Maxwell (massless spin-1) equations can be easily derived by invoking simple group theoretic arguments on the Poincare invariance of wave functions with extra degrees of freedom. Furthermore, these extra degrees of freedom are shown to correspond to the particle's spin. As a consequence, the algebraic structure and representations of the Poincare group ultimately dictate the dynamics of relativistic particles with arbitrary spin. In this paper we will discuss the group theoretic structure of discrete-time quantum walks that lead to relativistic quantum equations. In particular, we explore how discrete-time quantum walks are able to replicate the structure of the Poincare group and the right approach to formulate answers to the questions posed above. (Received September 25, 2012)