Abstract Submitted for the MAR14 Meeting of The American Physical Society

**Open Quantum Walks with Noncommuting Jump Operators**<sup>1</sup> ROLAND CRISTOPHER CABALLAR, University of KwaZulu-Natal and University of the Philippines, FRANCESCO PETRUCCIONE, ILYA SINAYSKIY, University of KwaZulu-Natal — We examine homogeneous open quantum walks along a line, wherein each forward step is due to one quantum jump operator, and each backward step due to another quantum jump operator. We assume that these two quantum jump operators do not commute with each other. We show that if the system has N internal degrees of freedom, for particular forms of these quantum jump operators, we can obtain exact probability distributions which fall into two distinct classes, namely Gaussian distributions and solitonic distributions. We also show that it is possible for a maximum of 2 solitonic distributions to be present simultaneously in the system. Finally, we consider applications of these classes of jump operators in quantum state preparation and quantum information.

<sup>1</sup>We acknowledge support from the National Institute for Theoretical Physics (NITheP).

Roland Cristopher Caballar University of KwaZulu-Natal and University of the Philippines

Date submitted: 22 Nov 2013

Electronic form version 1.4