1116-81-2181 **Hideaki Obuse*** (hideaki.obuse@eng.hokudai.ac.jp), Department of Applied Physics, Hokkaido University, Sapporo, Hokkaido 060-8628, Japan. *Topological phases of a $\mathcal{PT}$ symmetric non-unitary quantum walk.*

Recently, a non-unitary one-dimensional quantum walk dynamics associated with gain and loss is implemented in a coupled fiber loops experiment [A. Regensburger *et al.*, Nature **488**, 167 (2012]. The fact that the absolute value of the eigenvalue of the non-unitary time-evolution operator is kept to be unity suggests that the quantum walk possesses $\mathcal{PT}$ symmetry (combined parity and time-reversal symmetry). In the present work, we directly identify the $\mathcal{PT}$ symmetry operator, and then verify $\mathcal{PT}$ symmetry of the time-evolution operator, which enable us to modify the system by keeping $\mathcal{PT}$ symmetry. We further study topological phases of the $\mathcal{PT}$ symmetric quantum walk, which is related to a topological insulator described by a $\mathcal{PT}$ symmetric non-Hermite Hamiltonian. We numerically confirm that the number of eigenvalues exhibiting localization is consistent with the topological number. We also find that only edge states originating to topological phases break $\mathcal{PT}$ symmetry in the proper setup. This provides a way to observe the highly intense probability of localized states originating to topological phases on the one-dimensional non-unitary quantum walk in the actual experimental setup. (Received September 22, 2015)