

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Does protective measurement imply the reality of the quantum state? MATTHEW LEIFER, Perimeter Institute for Theoretical Physics, JOSHUA COMBES, University of Waterloo, CHRIS FERRIE, University of New Mexico, MATTHEW PUSEY, Perimeter Institute for Theoretical Physics — In 1993, Aharonov and Vaidman claimed that the quantum state of a single system could be measured in a scheme they called “protective measurement” and hence that the quantum state must be a real property of a single system. Despite attracting considerable controversy, we do not think that the existing criticisms have put their finger on precisely what is wrong with this claim. We explain why we think that, in the protective measurement scheme, the vast majority of the information about the quantum state comes from the protection operation rather than from the state itself. We also give simple toy models of protective measurement which show that the protection operation effectively reprepares the system in an independent copy of the initial state. Thus determining the quantum state by protective measurement is conceptually no different from performing state tomography on an ensemble of independently prepared systems.

Matthew Leifer
Perimeter Institute for Theoretical Physics

Date submitted: 06 Nov 2014

Electronic form version 1.4