DUALITY QUANTUM COMPUTERS AND QUANTUM OPERATIONS

Stan Gudder

Department of Mathematics

University of Denver

Denver, Colorado 80208

stan.gudder@nsm.du.edu

We present a mathematical theory for a new type of quantum computer called a duality quantum computer that has recently been proposed. We discuss the nonunitarity of certain circuits of a duality quantum computer and point out a paradoxical situation that occurs when mixed states are considered. It is shown that a duality quantum computer can measure itself without needing a separate measurement apparatus to determine its final state. Finally, we discuss the relevance of this work to quantum operations and their convexity theory.