Abstract Submitted for the MAR09 Meeting of The American Physical Society

Berry's Phase of a Current-Biased Josephson Junction<sup>1</sup> ANTHONY TYLER, DrexelUniversity, ROBERTO RAMOS, ZECHARIAH THRAILKILL, SAM KENNERLY, Drexel University — A quantum system, prepared in an eigenstate, can accumulate a geometric phase known as Berry's phase in addition to the expected dynamic phase. This occurs when there are adiabatic changes to the Hamiltonian which trace a closed loop in parameter space. A common example of this phase is an electron in a slowly varying magnetic field which traces a closed path. From this adiabatic variation, the electron's spin state has acquired a Berry's phase in addition to the dynamic phase. Due to the similarities between spin-1/2 particles, such as the electron, and solid state quantum bits (qubits), there should be an analogous process by which these system can gain a Berry's phase. Such processes have been tested in the charge qubit and has been derived for the flux qubit. Here, we will derive the Berry's phase for a phase qubit which can be found experimentally using quantum state tomography. We then utilize this to explore the possibility of creating topological gates with phase qubits.

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Date submitted: 25 Nov 2008

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