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Measurement-Induced Geometric Phases

We combine the idea of geometric phases (Berry phases) in quantum mechanics with the notion of weak measurements, in the sense of measurements inducing only a small back action. For this purpose, we examine two different measurement methods: Firstly, dynamics induced by the interaction with a binary detector system which could describe, for instance, measurements with qubit-like detectors such as two-level atoms. Secondly, dynamics due to continuous measurements which describe average measurement schemes like, for instance, electric currents flowing through quantum systems. For both measurement models, we obtain a dependence of the geometric phase on the measurement strength.