

Abstract Submitted  
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**Possibilities of a test of the temporal Bell inequalities using a flux qubit coupling to a dcSQUID**<sup>1</sup> MAO-CHUANG YEH, ANTHONY J. LEGGETT, Univ of Illinois - Urbana — Although then last few years have seen tests of the temporal Bell inequalities (TBI) on microscopic systems with the use of “ideal negative result” (INR) measurements [1], and on macroscopic systems using weak measurement [2], to date there have been no tests on macroscopic systems using INR measurements. Moreover, in neither case was the assumption of non-invasiveness explicitly tested in an ancillary experiment [3,4]. Here we propose a complete INR protocol, including the ancillary experiment, for a test of the TBI on a macroscopic system, namely a flux qubit, with the measuring apparatus a dc SQUID. The general setup mirrors that of Knee et al. [1], with the nuclear spins replaced by the flux qubit and the electron spins by the dc SQUID, and we analyze the relation between the theoretical concept of “venality” introduced in ref. [1] and the experimental behavior expected in our ancillary test. On the basis of this analysis we assess the current feasibility of the proposed experiment.

[1] G. C.Knee et al., Nature Comm. 3, 606 (2012).

[2] A. Palacios-Laloy et al., Nature Phys. 6, 442(2010).

[3] A. J. Leggett, Found. Phys.18, 939 (1988).

[4] A.Mizel and A.Wilde, Found. Phys. 42, 256-265(2012).

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