

Abstract Submitted  
for the MAR11 Meeting of  
The American Physical Society

**Protection of quantum systems by nested Uhrig dynamical decoupling**<sup>1</sup> ZHEN-YU WANG, REN-BAO LIU, Department of Physics, The Chinese University of Hong Kong — Based on a theorem we establish on dynamical decoupling of time-dependent systems, we present a scheme of nested Uhrig dynamical decoupling (NUDD) to protect multi-qubit systems in generic quantum baths to arbitrary decoupling orders. This scheme uses only single-qubit operations. Higher order decoupling is achieved at the cost of a polynomial increase in pulse number. For general multi-level systems, this scheme protects a set of unitary Hermitian system operators which mutually either commute or anti-commute, and hence all operators in the Lie algebra generated from this set of operators, generating an effective symmetry group for the system up to a given order of precision. We also show how to implement NUDD with pulses of finite amplitude, up to an error in the second order of the pulse durations.

<sup>1</sup>This work was supported by Hong Kong GRF CUHK402209.

Zhen-Yu Wang  
Department of Physics, The Chinese University of Hong Kong

Date submitted: 16 Dec 2010

Electronic form version 1.4