Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Quantum metrology with Landau-Zener transitions JING YANG, SHENGSHI PANG, ANDREW JORDAN, Univ of Rochester — In this talk, we present the fundamental precision limits in estimating the parameters with Landau-Zener transitions. For the case of a single Landau-Zener transition, rather than using the celebrated Landau-Zener transition probabilities, where the precision is quantified by the classical Fisher information, we show that using the acquired phase, higher precision may be obtained. The measurement precision is quantified by the quantum Fisher information for this scheme, which scales asymptotically as T^4 for estimating the sweeping velocity and lnT for estimating the tunneling amplitude, where T is the elapsed time, which can be further improved with controls. We also consider the case of multiple transitions before measurement, "Landau-Zener-Stueckelberg interferometry", and show that with proper quantum controls quantum Fisher information for estimating the transition frequency can still achieve T^4 scaling, although the Hamiltonian is bounded.

Jing Yang
Univ of Rochester

Date submitted: 08 Nov 2016 Electronic form version 1.4