Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Quantum Noise Interferometry: Phase transitions and entanglement in cold atoms in optical lattices INDUBALA SATIJA, George Mason University, ANA MARIA REY, ITAMP, Harvard -Smithsonian Center of Astrophysics, CHARLES CLARK, NIST — "Intensity interferometry," known as Hanbury-Brown Twiss (HBT) interferometry where quantum noise is used as a tool to detect quantum correlations is emerging as a very effective tool in the study of various complexities of strongly correlated systems. The technique is based on "bunching" effect of bosons and corresponding "Anti-bunching" of fermions due to the underlying quantum statistics. In cold atomic systems HBT can be done by detailed analysis of time of flight images of the expanded atomic cloud. We demonstrate the importance of the intrinsic quantum noise in the study of quantum phase transitions such as the Anderson-type transition in strongly interacting bosons, and the magnetic phase transition in quantum Ising models. We argue that noise interferometry provides a new order parameter for characterizing quantum phase transitions and may be viewed as a measure of quantum entanglement.

Ana Maria Rey
ITAMP, Harvard -Smithsonian Center of Astrophysics

Date submitted: 05 Feb 2007 Electronic form version 1.4