Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Many-body correlations in a one-dimensional spin chain with simplified dipole-dipole interactions ANDRE CIDRIM, Federal University of Sao Carlos (UFSCar), TOMMASO MACRI, Federal University of Rio Grande do Norte (UFRN) and International Institute of Physics, ANA MARIA REY, JILA, NIST, and Department of Physics University of Colorado, ROMAIN BACHELARD, Federal University of Sao Carlos (UFSCar) — We address the possibility of generating many-body quantum correlations in cold atomic ensembles scattering light. In particular, we consider an ordered 1D chain of two-level spins under the influence of a magnetic field that orients their dipole moments along the magic angle, thus simplifying the dipolar interactions solely to terms $\propto 1/r$. For the subwavelength limit where the lattice spacing $a < \lambda$, implying that dipole-dipole interactions are dominant and can induce stronger correlations, we observe an anti-ferromagnetic steady-state solution of the coherent dipole master equation. We thus analyze this state's tomography, measuring the pair-wise spin concurrence and other quantum-correlation quantifiers. We extend our analysis to a more complex system of multi-level atoms. Current experiments with atoms trapped by optical tweezers are particularly interesting platforms to implement this limit, due to the high degree of control they offer.

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Date submitted: 01 Feb 2019 Electronic form version 1.4