Mesoscopic Lattice Boltzmann Representation for Quantum to Classical Turbulence[1] BO ZHANG, GEORGE VAHALA, William & Mary, LINDA VAHALA, Old Dominion University — Here we present a lattice Boltzmann (LB) mesoscopic representation of the Gross-Pitaevskii equation to examine the multi-scale physics of turbulence spanning the quantum vortex core scales to the classical large scales were the quantization of vortices is unimportant. While the unitary mesoscopic algorithm faithfully represents the Hamiltonian structure of GP, the LB representation is at first glance dissipative. The macroscopic nonlinearities are recovered by phase shifts – just as in the mesoscopic qubit unitary algorithm. However, this dissipative effect can be rescaled in time. Soliton collisions as well as turbulence will be considered and compared to the unitary algorithm.

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