Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Spin-incoherent Luttinger liquid of one-dimensional SU(κ) fermions HSIANG-HUA JEN, Institute of Physics, Academia Sinica, SUNGKIT YIP, Institute of Physics and Institute of Atomic and Molecular Sciences, Academia Sinica — We investigate spin-incoherent one-dimensional (1D) SU(κ) fermions in a harmonic trap. Specifically we focus on Tonks-Girardeau gas limit where its density is sufficiently low that effective repulsions between atoms become infinite. In such case, spin exchange energy of 1D SU(κ) fermions vanishes and all spin configurations are degenerate, which automatically puts them into spin-incoherent regime. In this limit, we can write down the spatial wave functions by the conventional Slater determinant, and furthermore we are able to express the single-particle density matrices in terms of those of anyons. This allows us to numerically simulate the number of particles up to $N = 32$. We numerically calculate single-particle density matrices for (1) equal populations for each components (balanced) and (2) all Sz manifolds included. We find their momentum distributions are broadened due to highly degenerate spin configurations, a signature of spin-incoherent regime. We then compare numerically calculated high momentum tails of momentum distributions with analytical predictions which are proportional to $1/p^4$, in good agreement. Thus, our theoretical study provides a direct comparison with experiments of repulsive multicomponent alkaline earth fermions.

Hsiang-Hua Jen
Institute of Physics, Academia Sinica

Date submitted: 26 Jan 2018 Electronic form version 1.4