Abstract Submitted
for the OSS21 Meeting of
The American Physical Society

**Soluble Model of Interacting Spin-polarized Fermions in One Dimension** NOAH KAMM, SETH GRABLE, HARSH MATHUR, Case Western Reserve University — Quantum matter exists in a variety of remarkable states beyond the familiar categories of solid, liquid and gas. The state of a quantum many-body system is determined by the interactions amongst the particles. Problems of many interacting quantum particles are notoriously difficult to solve, but for particles in one dimension with a contact interaction, some exact results are known. Notably, for bosonic particles in one dimension with a delta function interaction, Lieb and Liniger found analytic solutions for various interaction strengths. These different states of one dimensional bosons have been studied experimentally by Kinoshita et al. in cold atom traps of Cesium atoms. However, for spin polarized fermionic particles with a delta function interaction it is known that they behave like a non-interacting fermion gas, regardless of the strength of the delta function potential. We have revisited this situation with a more general form of contact interaction recently discovered by Thompson et al. We predict that, under these interactions, the fermions form a new liquid state of fermionic matter that is reminiscent of Lieb-Liniger bosons. This novel state could be studied experimentally in cold atom traps loaded with suitable spin polarized fermions.

Noah Kamm
Case Western Reserve University

Date submitted: 28 Mar 2021 Electronic form version 1.4