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Competing orders of a magnetic impurity lattice in a one-dimensional Fermi gas MICHAEL SCHECTER, MARK RUDNER, KARSTEN FLENSBERG, Niels Bohr Institute — We investigate the magnetic order of a classical spin chain interacting via a local exchange with one-dimensional free fermions. Within a variational ansatz for the ordering spin-field, we find the exact phase boundaries between competing (anti)-ferromagnetic and spiral orders as a function of the local exchange coupling strength and inter-impurity spacing. The analysis applies for arbitrary coupling strength, and demonstrates that a rich variety of competing ground states is possible even at weak exchange coupling. Thus our results go beyond the frequently discussed RKKY limit where spiral order is preferred. We discuss various implications of our results in relation to recent work on producing topological states using magnetic adatoms on superconducting metals.

Michael Schecter
Niels Bohr Institute

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