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Thermal melting of density wave order on the square lattice
ADRIAN DEL MAESTRO, SUBIR SACHDEV, Yale University — We present a theory of thermal fluctuations which melt a commensurate $p \times p$ density wave ordered state on the square lattice. A phase diagram is constructed which will act as a springboard to a variety of interesting phases and phase transitions. The commensurate lock-in solid can in general melt to either an incommensurate floating solid or by a second order phase transition to an anisotropic (striped) floating state with p-periodic order along one direction and incommensurate quasi long range order in the other direction. In either case, this transition will be accompanied by the proliferation of domain walls, with the adjacent state being distinguished by the sign of the domain wall interaction energy. The fully disordered high temperature state can be reached from the floating solid by a second order transition mediated by dislocations. For $p = 4$, and at special commensurate densities, the $p \times p$ commensurate state can melt directly into the disordered state via a self-dual critical point with non-universal exponents.

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