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. Dynamical violation of scale invariance and the dilaton in a cold Fermi gas

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We study an exotic phase of a cold, two-dimensional, N -component Fermi gas which exhibits dynamically broken approximate scale symmetry. We identify a particular weakly damped collective excitation as the dilaton, the pseudo-Goldstone boson associated with the broken approximate scale invariance. We argue that the symmetry breaking phase is stable for a range of parameters of the theory and there is a fluctuation induced first order quantum phase transition between the normal and the scale symmetry breaking phases. This system provides a concrete cold atoms example of the Coleman-Weinberg phenomenon of dynamical violation of scale symmetry as well as a quantum field theoretical system where the Higgs field is a dilaton.

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