

# Nonlinear Bosonization of Fermi Surfaces

We develop a new method for bosonizing the Fermi surface based on the formalism of the coadjoint orbits. This allows one to parametrize the Fermi surface by a bosonic field that depends on the spacetime coordinates and on the position on the Fermi surface. The Wess-Zumino-Witten term in the effective action, governing the adiabatic phase acquired when the Fermi surface changes its shape, is completely fixed. As an effective field theory the action also involves a Hamiltonian which contains, beside the kinetic energy and the Landau interaction, terms with arbitrary number of derivatives and fields. We show that the resulting local effective field theory captures both linear and nonlinear effects in Landau's Fermi liquid theory. The approach can be extended to incorporate spin degrees of freedom and the charge-2 fields corresponding to the BCS order parameter.