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Identifying Large Charge Operators

Friday 8 July 2022 11:00 (30 minutes)

The Large Charge sector of Conformal Field Theory can generically be described through a semiclassical expansion around a superfluid background. Focussing on $U(1)$ invariant Wilson-Fisher fixed points, I will discuss the spectrum of spinning large charge operators. For sufficiently low spin these correspond to the phonon excitations of the superfluid state. I will describe the organization of these states into conformal multiplets and the form of the corresponding composite operators in the free field theory limit. The latter entails a mapping, built order-by-order in the inverse charge $n^{-1/2}$, between the Fock space of vacuum fluctuations and the Fock space of fluctuations around the superfluid state. I will comment on the limitations of the semiclassical method, in particular the fact that the phonon description breaks down for spins of order $n^{1/2}$ while the computation of observables seems valid up to spins of order n. Finally, I will show that this knowledge of the operator spectrum is useful to analyze the conformal block decomposition of some 4-point functions. Based on a work in progress with A. Monin and R. Rattazzi.

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