

Measuring dynamic correlation functions

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Dynamic (or two-time) correlation functions of quantum mechanical systems are complex quantities, and their experimental accessibility may be complicated by measurement backaction. In this talk I discuss ways of determining dynamic correlation functions by projective and/or noninvasive measurement protocols. I show that the real part of a dynamical correlation function is not affected by backaction, and hence can be measured projectively. To measure the imaginary part I introduce a protocol based on noninvasive measurements, which are achieved by weak ancilla-system couplings. The deviation of the measured correlation function from the theoretical, unitarily-evolved one is quantified. On the basis of these error bounds it is possible to predict optimal parameter settings for the noninvasive measurement protocol. Finally I discuss an experimental implementation of the noninvasive measurement protocol in ion trap-based quantum simulators.