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Spectral functions for hot pions below Tc

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Long-distance properties of QCD are non-perturbative in nature. Lattice computations provide a reliable tool for extracting such information for correlation functions in the space-like domain of momenta, for example for screening phenomena. However, the approach to equilibrium of QCD matter requires knowledge of correlation functions in the time-like domain.

Analytic continuation of correlation functions from space-like to time-like momenta require knowledge of a spectral function. There are few known constraints on the nature of spectral functions at finite temperature. Computations in the weak-coupling theory, provide constraints at high momenta. Analytic continuations of lattice data otherwise have used "zero-knowledge schemes" such as MEM. However, any further information on the nature of spectral functions would help to guard against unknown theoretical biases.

Here we apply an effective field theory (EFT) which was developed recently to examine correlators of axial currents. This is a generalization of the Nambu-Jona-Lasinio model applied to finite temperatures. This was parametrized to describe lattice data obtained with two flavours of light dynamical Wilson quarks.

We use this effective field theory to examine the analytic continuation of correlation functions of composite pion operators below T_c from the space-like to the time-like domain. Several interesting phenomena are observed: the analytic continuation of the pion mass and decay constant are non-trivial. We discuss the complex behaviour of the corresponding spectral function.

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