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Chiral symmetry restoration and the thermal $f_0(500)$ state.

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We analize the role played by the thermal $f_0(500)$ state or σ in chiral symmetry restoration. The temperature corrections to the spectral properties of that state are included in order to provide a better description of the scalar susceptibility χ_S around the transition region. We use the Linear Sigma Model to establish the relation between χ_S and the σ propagator, which is used as a benchmark to test the approach where χ_S is saturated by the $f_0(500)$ inverse self-energy. Within such saturation approach, a peak for χ_S around the chiral transition is obtained when considering the $f_0(500)$ generated as a $\pi\pi$ scattering pole within Unitarized Chiral Perturbation Theory at finite temperature. That approach yields results complying with lattice data when the uncertainties of the low-energy constants are taken into account. Those uncertainties and the unitarization method are used to check the robustness of this approximation. A comparison with the Hadron Resonance Gas is also studied in this context. Finally, we will discuss some recent results within the chiral lagrangian framework related to the topological susceptibility and its connection with chiral and $U_A(1)$ restoration.

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