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Pion scattering, light resonances and chiral symmetry restoration at nonzero chiral imbalance and temperature

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Abstract

We calculate the pion scattering amplitude at nonzero temperature and nonzero mu_5, the chemical potential associated to chiral imbalance in a locally P-breaking scenario. The amplitude is calculated up to next to leading order in Chiral Perturbation Theory and is unitarized with the Inverse Amplitude Method to generate the poles of the $f_0(500)$ and $rho (770)$ resonances. Within the saturation approach, the thermal $f_0(500)$ pole allows to determine $T_c(mu_5)$, the transition temperature for chiral symmetry restoration. Our results confirm the growing behaviour of $T_c(mu_5)$ found in previous works and, through a fit to lattice results, we improve the uncertainty range of the low-energy constants associated to mu_5 corrections in the chiral lagrangian. The results for the $rho (770)$ pole are compatible with previous works regarding the dilepton yield in heavy-ion collisions.

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