Juan Santiago Cortes, J Astrophys Aerospace Technol 2016, 4:3(Suppl)
http://dx.doi.org/10.4172/2329-6542.C1.005

Pion-Pion elastic scattering, dynamical generation of the $f_0(500)$ resonance, finite-temperature effects and chiral restoration: A large-N approach

Juan Santiago Cortes
Universidad de los Andes, Colombia

We present some results that have been obtained in previous works regarding the large-N pion scattering phenomenology at both zero and finite temperature. This is fully attained when working with an *O(N+1)/O(N)* non-linear sigma model (NLSM) in the chiral limit (i.e., a large number of *N* massless pions) as an approach for low-energy QCD, and after introducing a thermal bath via the imaginary time formalism. At zero temperature, we fit the parameters of the NLSM to obtain an accurate description of the scattering data in the scalar channel and in this way, dynamically generate the $f_0(500)$ resonance, whose pole position (mass and decay width) is in good accordance with experimental determinations. After building up the pion scattering amplitude at non-zero temperature, we check that thermal unitarity holds exactly; thanks to this, we study the behavior with temperature of the resonance mentioned before and see how it is related with chiral symmetry restoration when a physical observable such as the scalar susceptibility is saturated by the $f_0(500)$ state. In this last case, we obtain a second-order phase transition result, something that is in accordance with lattice and theoretical analysis. Besides this, we find that the critical exponent associated with the susceptibility lies within the range expected for a four-dimensional *O(N)* universality class. Finally, we show some insights of our newest research interests, also related with phase transitions and QCD critical phenomena in this framework.

Biography

Juan Santiago Cortes is a PhD candidate from Universidad de los Andes, MSc in Physics from Centro Brasileiro de Pesquisas Fisicas (2010), and BSc in Physics from Universidad Nacional de Colombia (2008). His main interests are: Effective field theories, Finite-temperature effects in low-energy QCD and phenomenology of particle physics.

js.cortes125@uniandes.edu.co

Notes: