Phase Diagram of the Linear Sigma Model wiht Quarks at Finite Temperature and Density EDWIN BOWMAN, JOSEPH KAPUSTA, University of Minnesota, EVGENI KOLOMEITSEV, GSI, Darmstadt — The study of QCD at low energies is relevant in explaining the world around us but is extremely difficult due to the mathematical structure of the theory. The linear sigma model is a well known and simple effective model for low-energy QCD. We couple the $O(4)$ linear sigma model to quark fields in order to study the effects of the quarks and mesons on the chiral phase transition as functions of the temperature T and the quark chemical potential μ_q. As an effective model for QCD, we hope to reproduce some aspects of the QCD phase diagram, namely, the line of first order transitions that has a critical end-point at a second order transiton. We study how this line varies with changing pion mass. We use the self-consistent Cornwall-Jackiw-Tomboulis method in an extended Hartree approximation using a summation over all daisy diagrams. We study the mesonic and quark properties, including mean field, fluctuations and effective masses and how they relate to the transition structure.

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