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Charged ρ meson in a magnetic field at finite temperature and chemical potential

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The charged vector ρ mesons in the presence of external magnetic fields at finite temperature T and chemical potential μ have been investigated in the framework of the Nambu–Jona-Lasinio model. We compute the masses of charged ρ mesons numerically as a function of the magnetic field for different values of T and μ. The self-energy of the ρ meson contains the quark-loop contribution, i.e. the leading order contribution in $1/N_c$ expansion. It is found that the charged ρ meson mass decreases as the magnetic field increases and drops to zero at a critical magnetic field eB_c. The charged vector meson condensation, i.e. the electromagnetic superconductor can be induced above the critical magnetic field. We find that at zero density, in the temperature range $200 - 500$ MeV, the critical magnetic field for charged ρ condensation is in the range of $0.2 - 0.6$ GeV^2, which indicates that high temperature superconductor could be created at LHC.

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