Melting Pattern of Diquark Condensates in Quark Matter *

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Abstract

Thermal color superconducting phase transitions in high density three-flavor quark matter are investigated in the Ginzburg-Landau approach. Effects of nonzero strange quark mass, electric and color charge neutrality, and direct instantons are considered. Weak coupling calculations show that an interplay between the mass and electric neutrality effects near the critical temperature gives rise to three successive second-order phase transitions as the temperature increases: a modified color-flavor locked (mCFL) phase (ud, ds, and us pairings) → a “dSC” phase (ud and ds pairings) → an isoscalar pairing phase (ud pairing) → a normal phase (no pairing). The dSC phase is novel in the sense that while all eight gluons are Meissner screened as in the mCFL phase, three out of nine quark quasiparticles are gapless.

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