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Resurgence and fractional instanton of the SU(3) gauge theory in weak coupling regime

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Motivated by recent studies on the resurgence structure of quantum field theories, we numerically study the nonperturbative phenomena of the SU(3) gauge theory in a weak coupling regime. We find that topological objects with a fractional charge emerge if the theory is regularized by an infrared (IR) cutoff via the twisted boundary conditions. Some configurations with nonzero instanton number are generated as a semi-classical configuration in the Monte Carlo simulation even in the weak coupling regime. Furthermore, some of them consist of multiple fractional-instantons. We also measure the Polyakov loop to investigate the center symmetry and confinement. The fractional-instanton corresponds to a solution linking two of degenerate Z₃-broken vacua in the deconfinement phase.

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