

# Equations for a Hybrid Chiral Bag with a Covariant Treatment of Center-of-Mass Motion

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**Abstract**—On the basis of a covariant generalization of the Bogolyubov method of collective coordinates, the hybrid chiral models of quark bags have been presented in the formulation taking exactly into account the motion of the bag center of mass. In this covariant approach, analytic relations between the fields involved arise from the effective finite-difference structure of the model when boundary conditions are imposed. We have analyzed in detail these relations and the interplay between the dynamics of quark and pion degrees of freedom. It has also been shown that, within the approach being discussed, the boundary conditions constrain the total baryon charge of the bag to be independent of the bag-surface position.