

High Energy Physics - Theory

Self-dual Hopfions

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We construct static and time-dependent exact soliton solutions with non-trivial Hopf topological charge for a field theory in 3+1 dimensions with the target space being the two dimensional sphere S^2 . The model considered is a reduction of the so-called extended Skyrme-Faddeev theory by the removal of the quadratic term in derivatives of the fields. The solutions are constructed using an ansatz based on the conformal and target space symmetries. The solutions are said self-dual because they solve first order differential equations which together with some conditions on the coupling constants, imply the second order equations of motion. The solutions belong to a sub-sector of the theory with an infinite number of local conserved currents. The equation for the profile function of the ansatz corresponds to the Bogomolny equation for the sine-Gordon model.

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