

High Energy Physics - Theory

Pure Skyrme-Faddeev-Niemi hopfions

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The pure Skyrme-Faddeev-Niemi model (i.e., without quadratic kinetic term) with a potential is considered on the spacetime $S^3 \times R$. For one-vacuum potentials two types of exact Hopf solitons are obtained. Depending on the value of the Hopf index, we find compact or non-compact hopfions. The compact hopfions saturate a Bogomolny bound and lead to a fractional energy-charge formula $E \sim |Q|^{1/2}$, whereas the non-compact solitons do not saturate the bound and give $E \sim |Q|$. In the case of potentials with two vacua compact shell-like hopfions are derived. Some remarks on the influence of the potential on topological solutions in the full Skyrme-Faddeev-Niemi model or in (3+1) Minkowski space are also made.

Comments: Latex, 16 pages, some typos corrected

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