

Lie Symmetrical Perturbation and Adiabatic Invariants of Generalized Hojman Type for Relativistic Birkhoffian Systems

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Abstract: For a relativistic Birkhoffian system, the Lie symmetrical perturbation and adiabatic invariants of generalized Hojman type are studied under general infinitesimal transformations. On the basis of the invariance of relativistic Birkhoffian equations under general infinitesimal transformations, Lie symmetrical transformations of the system are constructed, which only depend on the Birkhoffian variables. The exact invariants in the form of generalized Hojman conserved quantities led by the Lie symmetries of relativistic Birkhoffian system without perturbations are given. Based on the definition of higher-order adiabatic invariants of a mechanical system, the perturbation of Lie symmetries for relativistic Birkhoffian system with the action of small disturbance is investigated, and a new type of adiabatic invariants of the system is obtained. In the end of the paper, an example is given to illustrate the application of the results.

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Key words: relativity, Birkhoffian system, Lie symmetrical perturbation, exact invariant, adiabatic invariant of generalized Hojman type

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