First Integrals and Integral Invariants of Relativistic Birkhoffian Systems

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Abstract: For a relativistic Birkhoffian system, the first integrals and the construction of integral invariants are studied. Firstly, the cyclic integrals and the generalized energy integral of the system are found by using the perfect differential method. Secondly, the equations of nonsimultaneous variation of the system are established by using the relation between the simultaneous variation and the nonsimultaneous variation. Thirdly, the relation between the first integral and the integral invariant of the system is studied, and it is proved that, using a first integral, we can construct an integral invariant of the system. Finally, the relation between the relativistic Birkhoffian dynamics and the relativistic Hamiltonian dynamics is discussed, and the first integrals and the integral invariants of the relativistic Hamiltonian system are obtained. Two examples are given to illustrate the application of the results.

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