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**Title:** Explicit K-symplectic methods for nonseparable non-canonical Hamiltonian systems

**Abstract:** We propose efficient numerical methods for nonseparable non-canonical Hamiltonian systems which are explicit, K-symplectic in the extended phase space with long time energy conservation properties. They are based on extending the original phase space to several copies of the phase space and imposing a mechanical restraint on the copies of the phase space. Explicit K-symplectic methods are constructed for two non-canonical Hamiltonian systems. Numerical tests show that the proposed methods exhibit good numerical performance in preserving the phase orbit and the energy of the system over long time, whereas higher order RungeKutta methods do not preserve these properties. Numerical tests also show that the K-symplectic methods exhibit better efficiency than that of the same order implicit symplectic, explicit and implicit symplectic methods for the original nonseparable non-canonical systems.