

# Spectrally accurate space-time solution of Hamiltonian PDEs

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## Abstract

Recently, the numerical solution of multi-frequency, highly-oscillatory Hamiltonian problems has been attacked by using Hamiltonian Boundary Value Methods (HBVMs) as spectral methods in time [1]. When the problem derives from the space semi-discretization of (possibly Hamiltonian) partial differential equations (PDEs), the resulting problem may be *stiffly-oscillatory*, rather than highly-oscillatory. In such a case, a different implementation of the methods is needed, in order to gain the maximum efficiency.

**Keywords:** Multi-frequency highly-oscillatory problems, stiffly-oscillatory problems, Hamiltonian problems, energy-conserving methods, spectral methods, Legendre polynomials, Hamiltonian Boundary Value Methods, HBVMs.

**MSC:** 65P10, 65L05, 65N35.

- [1 ] L. Brugnano, J.I. Montijano, L. Rández. On the effectiveness of spectral methods for the numerical solution of multi-frequency highly-oscillatory Hamiltonian problems. *Numer. Algorithms* (2018) <http://dx.doi.org/10.1007/s11075-018-0552-9>

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