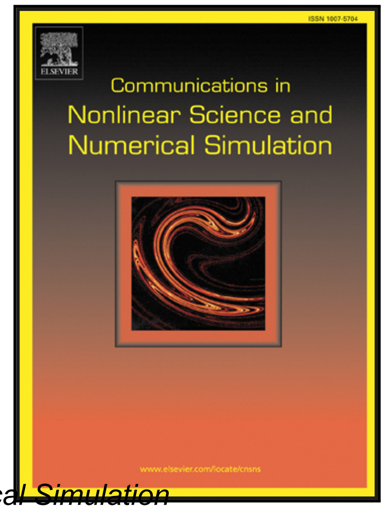
Accepted Manuscript



Stationary multi-wave resonant ensembles in a microtubule

Nikitenkova S.P., Kovriguine D.A.

PII: S1007-5704(18)30178-3
DOI: 10.1016/j.cnsns.2018.06.001
Reference: CNSNS 4543

To appear in: *Communications in Nonlinear Science and Numerical Simulation*

Received date: 18 July 2016
Revised date: 27 March 2018
Accepted date: 2 June 2018

Please cite this article as: Nikitenkova S.P., Kovriguine D.A., Stationary multi-wave resonant ensembles in a microtubule, *Communications in Nonlinear Science and Numerical Simulation* (2018), doi: 10.1016/j.cnsns.2018.06.001

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Stationary multi-wave resonant ensembles in a microtubule

Nikitenkova S.P.[a,*], Kovriguine D.A.[b]

[a] Nizhny Novgorod State University n.a. N.I. Lobachevsky. Radiophysics Faculty. Russia, 603950 Nizhny Novgorod, Gagarin ave., 23, Building 4
[b] Nizhny Novgorod Technical State University n.a. R.E. Alekseev. Applied Mathematics Chair. Russia, 603000 Nizhny Novgorod, Minin St., 24, Building 1

Abstract

Stationary energy distribution between nonlinearity coupled modes of oscillations in microtubules is investigated using standard asymptotic approaches in the framework of classical mechanics. The first–order approximation analysis reveals three various types of triple–mode resonant ensembles consisting of one longitudinal wave and a pair of transverse modes being in phase. In turn, the nonlinear coupling between triads of various types and spectral states creates stationary multi-mode resonant ensembles. The corresponding stationary multi-mode solutions exhibit Lyapunov–stable quasiperiodic orbits in contrast to chaotic motions inherent in the same system. It is found that the energy distribution in microtubules being in thermal equilibrium is described by a recursive function that cannot be reduced to well-known classical statistical laws. Also, multi-frequency envelope solitons, taking place far from the thermal equilibrium of a microtubule, are possible when getting some portion of energy from the environment. The mechanical momentum of such solitons can propagate along microtubules without dispersion in long distances that can help for efficient heat exchange as well as in providing coherent movement of motor organelles.

Keywords: microtubule, stationary energy distribution, amplitude dispersion,

*Corresponding author
Email address: snikitenkova@gmail.com (Nikitenkova S.P.)

ACCEPTED MANUSCRIPT

Download English Version:

https://daneshyari.com/en/article/11003763

Download Persian Version:

https://daneshyari.com/article/11003763

Daneshyari.com