Cornell University Library

We gratefully acknowledge support from the Simons Foundation and member institutions

arXiv.org > nlin > arXiv:1106.4861

Search or Article-id (Help | Advanced search) All papers Go!

Nonlinear Sciences > Pattern Formation and Solitons

Ratchet effect on a relativistic particle driven by external forces

Niurka R. Quintero, Renato Alvarez-Nodarse, José A. Cuesta

(Submitted on 23 Jun 2011)

We study the ratchet effect of a damped relativistic particle driven by both asymmetric temporal bi-harmonic and time-periodic piecewise constant forces. This system can be formally solved for any external force, providing the ratchet velocity as a non-linear functional of the driving force. This allows us to explicitly illustrate the functional Taylor expansion formalism recently proposed for this kind of systems. The Taylor expansion reveals particularly useful to obtain the shape of the current when the force is periodic, piecewise constant. We also illustrate the somewhat counterintuitive effect that introducing damping may induce a ratchet effect. When the force is symmetric under time-reversal and the system is undamped, under symmetry principles no ratchet effect is possible. In this situation increasing damping generates a ratchet current which, upon increasing the damping coefficient eventually reaches a maximum and decreases toward zero. We argue that this effect is not specific of this example and should appear in any ratchet system with tunable damping driven by a time-reversible external force.

Comments: 1 figure

Subjects: **Pattern Formation and Solitons (nlin.PS)**; Statistical Mechanics (cond-mat.stat-mech)

Cite as: **arXiv:1106.4861 [nlin.PS]**

(or **arXiv:1106.4861v1 [nlin.PS]** for this version)

Submission history

From: Niurka Quintero R [view email]

[v1] Thu, 23 Jun 2011 23:50:59 GMT (20kb)

Which authors of this paper are endorsers?

Link back to: arXiv, form interface, contact.

Download:

- PDF
- PostScript
- Other formats

Current browse context:
nlin.PS
< prev | next >
new | recent | 1106

Change to browse by:
cond-mat
cond-mat.stat-mech
nlin

References & Citations
- NASA ADS

Bookmark(what is this?)