

Synchronization of oscillators with long range power law interactions

Debanjan Chowdhury, M. C. Cross

(Submitted on 7 Mar 2010)

We present analytical calculations and numerical simulations for the synchronization of oscillators interacting via a long range power law interaction on a one dimensional lattice. We have identified the critical value of the power law exponent α_c across which a transition from a synchronized to an unsynchronized state takes place for a sufficiently strong but finite coupling strength in the large system limit. We find $\alpha_c=3/2$. Frequency entrainment and phase ordering are discussed as a function of $\alpha \geq 1$. The calculations are performed using an expansion about the aligned phase state (spin-wave approximation) and a coarse graining approach. We also generalize the spin-wave results to the d -dimensional problem.

Comments: 13 pages, 11 figures

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

Cite as: [arXiv:1003.1447v1](https://arxiv.org/abs/1003.1447v1) [cond-mat.stat-mech]

Submission history

From: Debanjan Chowdhury [[view email](#)]

[v1] Sun, 7 Mar 2010 09:50:05 GMT (621kb)

[Which authors of this paper are endorsers?](#)

Download:

- [PDF](#)
- [PostScript](#)
- [Other formats](#)

Current browse context:

cond-mat.stat-mech

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1003](#)

Change to browse by:

[cond-mat](#)

[nlin](#)

[nlin.PS](#)

References & Citations

- [CiteBase](#)

Bookmark (what is this?)

[CiteULike logo](#)

[Connotea logo](#)

[BibSonomy logo](#)

[Mendeley logo](#)

[Facebook logo](#)

[del.icio.us logo](#)

[Digg logo](#)

[Reddit logo](#)