

Accepted Manuscript

Hamiltonian formulation of systems with balanced loss-gain and exactly solvable models

Pijush K. Ghosh, Debdeep Sinha

PII: S0003-4916(17)30333-0

DOI: <https://doi.org/10.1016/j.aop.2017.11.018>

Reference: YAPHY 67536

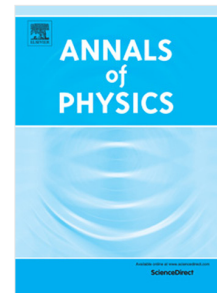
To appear in: *Annals of Physics*

Received date: 28 July 2017

Accepted date: 14 November 2017

Please cite this article as: P.K. Ghosh, D. Sinha, Hamiltonian formulation of systems with balanced loss-gain and exactly solvable models, *Annals of Physics* (2017), <https://doi.org/10.1016/j.aop.2017.11.018>

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.



Hamiltonian formulation of systems with balanced loss-gain and exactly solvable models

Pijush K. Ghosh* and Debdeep Sinha†

Department of Physics, Siksha-Bhavana,
Visva-Bharati University,
Santiniketan, PIN 731 235, India.

Abstract

A Hamiltonian formulation of generic many-body systems with balanced loss and gain is presented. It is shown that a Hamiltonian formulation is possible only if the balancing of loss and gain terms occur in a pairwise fashion. It is also shown that with the choice of a suitable co-ordinate, the Hamiltonian can always be reformulated in the background of a pseudo-Euclidean metric. If the equations of motion of some of the well-known many-body systems like Calogero models are generalized to include balanced loss and gain, it appears that the same may not be amenable to a Hamiltonian formulation. A few exactly solvable systems with balanced loss and gain, along with a set of integrals of motion is constructed. The examples include a coupled chain of nonlinear oscillators and a many-particle Calogero-type model with four-body inverse square plus two-body pair-wise harmonic interactions. For the case of nonlinear oscillators, stable solution exists even if the loss and gain parameter has unbounded upper range. Further, the range of the parameter for which the stable solutions are obtained is independent of the total number of the oscillators. The set of coupled nonlinear equations are solved exactly for the case when the values of all the constants of motions except the Hamiltonian are equal to zero. Exact, analytical classical solutions are presented for all the examples considered.

keywords: Hamiltonian formulation, Exactly solvable models, Dissipative system, Coupled nonlinear oscillators, Calogero-type model

Contents

1	Introduction	2
2	Hamiltonian Formulation	5
2.1	Representation of Matrices	7
2.2	Examples	9
2.3	Rational Calogero Model(RCM)	11

*email: pijushkanti.ghosh@visva-bharati.ac.in

†email: debdeepsinha.rs@visva-bharati.ac.in

Download English Version:

<https://daneshyari.com/en/article/8201573>

Download Persian Version:

<https://daneshyari.com/article/8201573>

[Daneshyari.com](https://daneshyari.com)