

Kozlov, V. V.

Linear systems with quadratic integral and complete integrability of the Schrödinger equation. (English. Russian original) [Zbl 1442.37079](#)

Russ. Math. Surv. 74, No. 5, 959-961 (2019); translation from Usp. Mat. Nauk 74, No. 5, 189-190 (2019).

The paper addresses a multidimensional D'Alembert (wave) equation in the n -dimensional space:

$$u_{tt} = a^2 \Delta u.$$

The integrability of this equation is a known fact. In the paper, the author extends this aspect of the equation, by explicitly constructing an infinite series of dynamical invariants, the lowest one being the standard Hamiltonian,

$$H = \frac{1}{2} \int d^n x \left[u_t^2 + a^2 \sum_n (u_{x_n}^2) \right].$$

Higher-order dynamical invariants are identified as integral expressions with the density expressed as quadratic expressions with respect the t - and x -derivatives of field u . In particular, the next dynamical invariant in the series is

$$\frac{a^2}{2} \int d^n x \left[\sum_n (u_{tx_n})^2 + a^2 (\Delta u)^2 \right].$$

Reviewer: [Boris A. Malomed \(Tel Aviv\)](#)

MSC:

- [37K10](#) Completely integrable infinite-dimensional Hamiltonian and Lagrangian systems, integration methods, integrability tests, integrable hierarchies (KdV, KP, Toda, etc.)
- [35Q55](#) NLS equations (nonlinear Schrödinger equations)
- [35L05](#) Wave equation

Cited in **3** Documents

Keywords:

[D'Alembert equation](#); [formal integrability](#)

Full Text: [DOI](#)

References:

- [1] В. В. Козлов 1992 ПММ56 6 900-906
- [2] English transl. V. V. Kozlov 1992 J. Appl. Math. Mech.56 6 803-809 · [Zbl 0792.70014](#) · [doi:10.1016/0021-8928\(92\)90114-N](#)
- [3] V. V. Kozlov 2018 Regul. Chaotic Dyn.23 1 26-46 · [Zbl 1400.37061](#) · [doi:10.1134/S1560354718010033](#)
- [4] Д. В. Трещёв, А. А. Шкаликков 2017 Матем. заметки101 6 911-918 · [doi:10.4213/mzm11520](#)
- [5] English transl. D. V. Treshchev and A. A. Shkalikov 2017 Math. Notes101 6 1033-1039 · [Zbl 06769031](#) · [doi:10.1134/S0001434617050303](#)
- [6] L. D. Faddeev 2007 Amer. Math. Soc. Transl. Ser. 2 220 83-90 · [doi:10.1090/trans2/220/04](#)
- [7] Д. В. Трещёв 2005 Тр. МИАН 250 226-261
- [8] English transl. D. V. Treschev 2005 Proc. Steklov Inst. Math.250 211-244
- [9] W. Miller, Jr., S. Post, and P. Winternitz 2013 Classical and quantum superintegrability with applications 1309.2694v1 124 pp.
- [10] В. В. Козлов, Д. В. Трещев 2004 ТМФ140 3 460-479 · [doi:10.4213/tmf103](#)
- [11] English transl. V. V. Kozlov and D. V. Treschev 2004 Theoret. and Math. Phys.140 3 1283-1298 · [Zbl 1178.81158](#) · [doi:10.1023/B:TAMP.0000039833](#)
- [12] В. В. Козлов 2005 Докл. РАН401 5 603-606
- [13] English transl. V. V. Kozlov 2005 Dokl. Math.71 2 300-302

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.