

***N*-WAVE TYPE SYSTEMS AND THEIR GAUGE EQUIVALENT RELATED TO THE ORTHOGONAL ALGEBRAS**

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Abstract. The reductions of the integrable *N*-wave type equations solvable by the inverse scattering method with the generalized Zakharov–Shabat system *L* and related to some simple Lie algebra *g* are analyzed. Special attention is paid to the \mathbb{Z}_2 -reductions including ones that can be embedded also in the Weyl group of *g*. The consequences of these restrictions on the structure of the dressing factors are outlined. An example of 4-wave equations (with application to nonlinear optics) and its gauge equivalent are given.

1. Introduction

The aim of the present paper is to study the class of *N*-wave equations [1, 8, 11–13], their generalizations to simple Lie algebras [2, 5] and their gauge equivalent ones extending the results in [6]. We describe their scattering data, dressing factors, 1-soliton solutions and outline some of their reductions.

The *N*-wave type equations related to the simple Lie algebras can be solved by applying the inverse scattering method for the generalized Zakharov–Shabat system [5]:

$$L(\lambda)\psi \equiv \left(i \frac{d}{dx} + [J, Q(x, t)] - \lambda J \right) \psi(x, t, \lambda) = 0 \quad (1)$$