



ON SOLITON INTERACTIONS FOR THE HIERARCHY OF A GENERALISED HEISENBERG FERROMAGNETIC MODEL ON $SU(3)/S(U(1) \times U(2))$ SYMMETRIC SPACE*

VLADIMIR GERDJKOV, GEORGI GRAHOVSKI, ALEXANDER
 MIKHAILOV[†] and TIHOMIR VALCHEV

*Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences
 72 Tsarigradsko chaussee, Sofia 1784, Bulgaria*

[†]*Applied Mathematics Department, University of Leeds, Leeds, LS2 9JT, UK*

Abstract. We consider an integrable hierarchy of nonlinear evolution equations (NLEE) related to linear bundle Lax operator L . The Lax representation is $\mathbb{Z}_2 \times \mathbb{Z}_2$ reduced and can be naturally associated with the symmetric space $SU(3)/S(U(1) \times U(2))$. The simplest nontrivial equation in the hierarchy is a generalization of Heisenberg ferromagnetic model. We construct the N -soliton solutions for an arbitrary member of the hierarchy by using the Zakharov-Shabat dressing method with an appropriately chosen dressing factor. Two types of soliton solutions: quadruplet and doublet solitons are found. The one-soliton solutions of NLEEs with even and odd dispersion laws have different properties. In particular, the one-soliton solutions for NLEEs with even dispersion laws are *not* traveling waves while their velocities and amplitudes are time dependent. Calculating the asymptotics of the N -soliton solutions for $t \rightarrow \pm\infty$ we analyze the interactions of quadruplet solitons.

CONTENTS

1. Introduction	12
2. Preliminaries	13
2.1. Polynomial Lax Pair Related to $SU(3)/S(U(1) \times U(2))$	14
2.2. Direct Scattering Problem	17
3. Dressing Method and Soliton Solutions	19

*Reprinted from J. Geom. Symmetry Phys. **25** (2012) 23–55.