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Gardner's deformations of the N=2 supersymmetric a=4-KdV equation

V. Hussin, A. V. Kiselev, A. O. Krutov, T. Wolf

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We prove that P.Mathieu's Open problem on constructing Gardner's deformation for the N=2 supersymmetric a=4-Korteweg-de Vries equation has no supersymmetry invariant solutions, whenever it is assumed that they retract to Gardner's deformation of the scalar KdV equation under the component reduction. At the same time, we propose a two-step scheme for the recursive production of the integrals of motion for the N=2, a=4-SKdV. First, we find a new Gardner's deformation of the Kaup-Boussinesq equation, which is contained in the bosonic limit of the super-hierarchy. This yields the recurrence relation between the Hamiltonians of the limit, whence we determine the bosonic super-Hamiltonians of the full N=2, a=4-SKdV hierarchy. Our method is applicable towards the solution of Gardner's deformation problems for other supersymmetric KdV-type systems.

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