February 26, 2024

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Some results of the study of the phase topology of the two-field generalized Kowalevski gyrostat

We consider the integrable system with three degrees of freedom for which V.V.Sokolov and A.V.Tsiganov specified a Lax representation. This representation generalizes the L–A pair of the Kowalevski gyrostat in two constant fields found by A.G.Reyman and M.A.Semenov-Tian-Shansky. In the talk, we give the explicit formulas for the almost everywhere independent additional first integrals K and G. These integrals are functionally connected with the coefficients of the spectral curve of the L–A pair by V.V.Sokolov and A.V.Tsiganov. Due to the obtained form of additional integrals K, G and parametric reduction by M.P.Kharlamov, we managed to find analytically invariant four-dimensional submanifolds on which the induced dynamic system is almost everywhere Hamiltonian system with two degrees of freedom. System of equations that describes one of these invariant submanifolds is a generalization of the invariant relations of the corresponding integrable O.I.Bogoyavlensky case for the rotation of a magnetized rigid body with a fixed point in homogeneous magnetic and gravitational fields. To describe phase topology of the system as a whole we use the method of critical subsystems. For each subsystem, we construct the bifurcation diagrams and specify the bifurcations of Liouville tori both in subsystems, and in the system as a whole.