
SITAI LI, State University of New York at Buffalo

Soliton solutions of Maxwell-Bloch equations with non-zero background

We present several exact solutions of the Maxwell-Bloch equations for non-degenerate two-level systems with non-zero background fields, derived by formulating the inverse scattering transform for systems with finite, non-zero boundary conditions for the optical field. We obtain the general form of N-soliton solutions for both the optical field and the density matrix. We then discuss in particular one-soliton solutions, both in the case of inhomogeneous broadening and in the sharp-line limit, and we analyze their properties. We also consider various limiting cases, which result in several additional solutions, such as time-periodic solutions and rational solutions. These soliton solutions, all of which are novel to the best of our knowledge, are the analogue for Maxwell-Bloch systems of the Kuznetsov-Ma solitons, Tajiri-Watanabe solitons, Akhmediev breathers and Peregrine solution of the focusing nonlinear Schrodinger equation. This is joint work with G. Biondini, I. Gabitov and G. Kovacic.