Coupled Maxwell-Bloch equations with inhomogeneous broadening for a 3-level system

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The phenomenon that describes the effect of a coherent medium response to an incident electric field, to which the medium is totally transparent and which undergoes lossless propagation, is known as self-induced transparency (SIT). SIT was first discovered by McCall and Hahn (1969) in the case of non-degenerate two-level atoms. Special solutions for the two-level system were found by Lamb (1971), while the initial value problem for the propagation of a pulse through a resonant two-level optical medium was solved by Inverse Scattering Transform (IST) in [1, 2].

It is possible to formulate the SIT equations in the framework of the IST also in the case of a three-level system, as in [3]. While the associated scattering problem is the same as for the coupled nonlinear Schrödinger equation, the time evolution depends on asymptotic values of the material polarizability envelopes and is highly non-trivial.

This talk will address the solution of the initial value problem for the SIT equations for three level systems, for generic preparation of the medium, and describe its soliton interactions.

References

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