McGill Computational Science and Engineering Seminar

Monday February 26th at 14:00 in Burnside Hall room 1205

Efficient Computational Methods for Nonlinear Wave Systems

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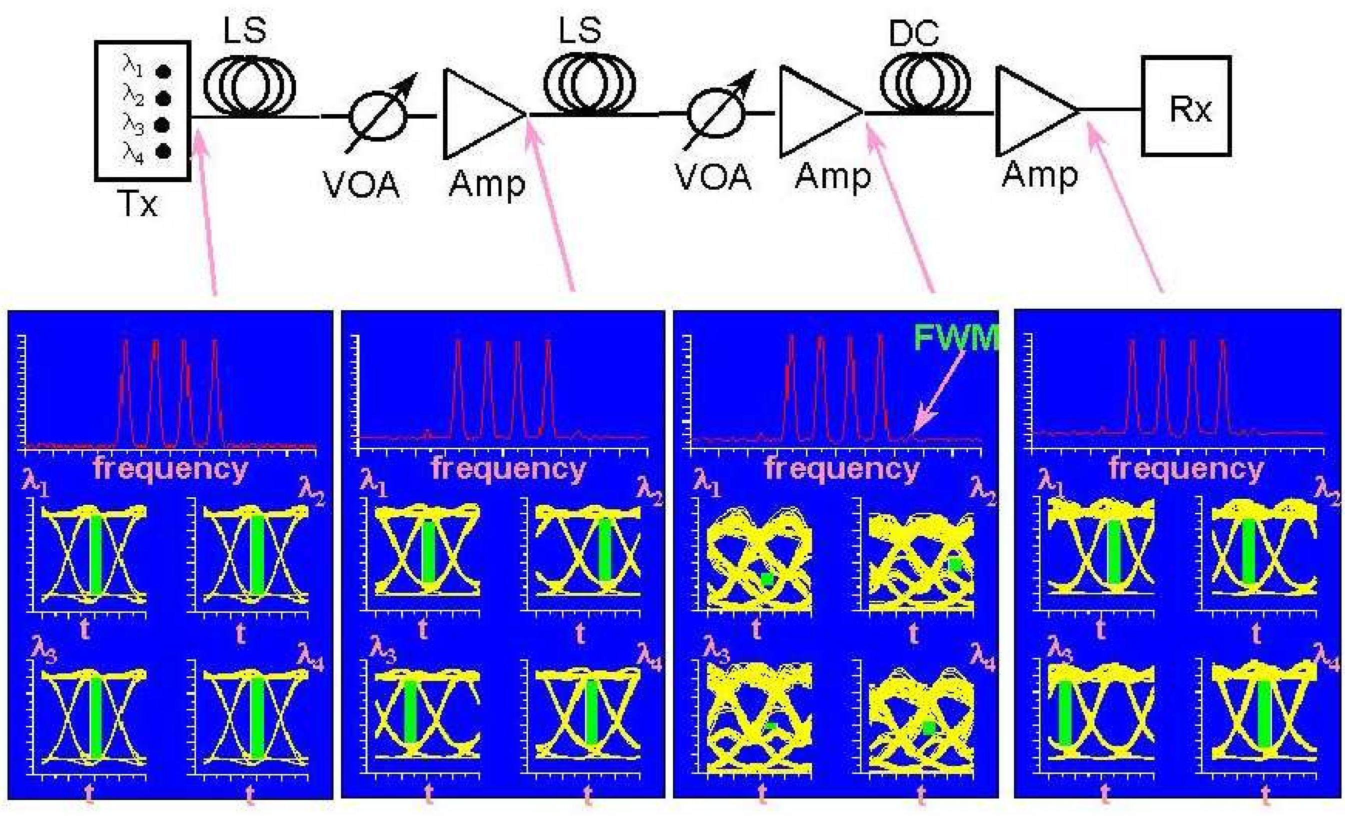
We present a class of efficient numerical schemes for evolution of nonlinear wave problems. In particular, the focus is on a variant of the Nonlinear Schrödinger Equation which models the propagation of light waves in optical fibers. In this context, a brief description of digital data transmission will be provided with emphasis on the underlying mathematical model. Often in problems such as this the parameter regime of interest corresponds to weak nonlinearity, naturally lending itself to a perturbative approach. By approximating the nonlinear effects with an appropriate truncation of the perturbation series, an accurate result may be obtained at relatively small computational expense. Then by using the ideas of analytic continuation, we show how this may be extended to more general parameter regimes and yield a robust, efficient numerical scheme. Comparisons will be made with methods currently used in the fiber design process.



Schematic of optical fiber network and signal distortion due to four wave mixing