Solid State Institute
המכון למצב מוצק

TECHNION
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הטכניון
מכון טכנולוגי
לישראל

SPECIAL SEMINAR

סמינר מיוחד

Controlling soliton dynamics in broadband nonlinear optical waveguide systems

Prof. Avner Peleg

Abstract

Transmission rates in broadband optical waveguide systems are significantly enhanced by launching many pulse sequences through the same waveguide. Since pulses from different sequences propagate with different group velocities, intersequence pulse collisions are very frequent, and can lead to severe transmission degradation. On the other hand, the energy exchange in pulse collisions can be beneficially used for realizing fast control of the transmission.

In the current work we develop a general approach for exploiting the energy exchange in intersequence collisions for transmission stabilization and switching, using solitons as the optical pulses. Along the way we also develop several methods for solving one of the most challenging problems in nonlinear waveguide optics - the problem of stabilizing broadband soliton transmission against resonant emission of small-amplitude waves. Our approach for transmission control is based on showing that collision-induced amplitude dynamics in N-sequence waveguide systems can be described by N-dimensional Lotka-Volterra (LV) models, where the model's form depends on the dissipative processes in the waveguide. Stability and bifurcation analysis for the equilibrium states of the LV models is used to develop ways for achieving robust transmission stabilization and switching that work well for a variety of waveguides including optical fibers and silicon waveguides. Furthermore, we show that supercritical Hopf bifurcations of the equilibrium states of the LV models can be used to induce large stable oscillations of soliton amplitudes along ultra-long propagation distances. The latter finding is an important step towards realizing spatio-temporal chaos with multiple sequences of colliding solitons in nonlinear optical waveguides.

ההרצאה תתקיים ביום שלישי ה-22.11.2016 בשעה 12:30*
בבניין פיסיקה (לידוב), קומת כניסה, נתן רוזן 300

The lecture will take place on Tuesday, 22.11.16 at 12:30*
at the Physics Building (Lidow), entrance floor, Nathan Rosen 300

12:15-Refreshments-"Pizza"** **"פיצות" -כיבוד - 12:15

Host: Professor Noam Soker