CRETE CENTER FOR QUANTUM COMPLEXITY AND NANOTECHNOLOGY

ΣΕΜΙΝΑΡΙΟ ΚΕΝΤΡΟΥ ΚΒΑΝΤΙΚΗΣ ΠΟΛΥΠΛΟΚΟΤΗΤΑΣ & ΝΑΝΟΤΕΧΝΟΛΟΓΙΑΣ/
CCQCN SEMINAR

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12:00-13:00

3rd Floor Seminar Room

Rogue Waves in Electromagnetic Beam-Plasma Interactions: modeling and phenomenology

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Abstract

Extreme events in the form of rogue waves (freak waves) occur widely in the open sea. These are space-and time-localised excitations, which appear unexpectedly and are characterised by significant amplitude (exceeding 2.5 times the average turbulence level in their environment). Beyond ocean dynamics, the mechanisms underlying rogue wave formation are now being investigated in various physical contexts, including materials science, nonlinear optics and plasma physics, to mention but a few .

Inspired by the ubiquity of this challenging phenomenon, we have undertaken an investigation, from first principles, of the occurrence of rogue waves associated with the propagation of an electromagnetic pulse in a plasma. A multiscale technique is employed to solve the fluid-Maxwell equations describing a weakly nonlinear circularly polarized electromagnetic pulses in collisional magnetized plasmas. A nonlinear Schrodinger (NLS) type equation is shown to govern the amplitude of the vector potential. A brief review of existing theories based on non-stationary envelope solutions of the NLS equation is presented (Peregrine soliton, Akhmediev breather, Kuznetzov-Ma breather), and the variation of their structural properties with the magnetic field is investigated. Recent advances on numerical investigations of the occurrence of rogue waves in plasmas are presented and discussed.

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ
ΤΜΗΜΑ ΦΥΣΙΚΗΣ