Zohar Henis – Curriculum Vitae

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Abstract

I have over 25 years of experience in theoretical and numerical modeling in area of laser interaction with matter and high energy density physics. I am holding a researcher position at Applied Physics Division, Soreq NRC Israel. I have published over 100 scientific publications in journals and refereed conferences.

Academic background

1976 – 1979 - B.Sc., Physics and Mathematics, Hebrew University, Jerusalem, Israel.
1979 – 1981 - M.Sc., Physics, Hebrew University, Jerusalem, Israel.
Thesis: "Vortex motion in neutron stars".
1987 – 1990 - PhD., Physics, Hebrew University.
Thesis: “Muon catalyzed fusion processes in the presence of strong electromagnetic fields”

Positions held

Present: Researcher position at Applied Physics Division, Soreq NRC, Israel.
2014-2016
Visiting scientist at the High Intensity Laser Lab, the Hebrew University, Jerusalem - Laser induced proton acceleration, filamentation during intense laser propagation in air.
2008- 2014
Head of Laser Plasma Interaction Theory Group, Soreq NRC, Israel - Analytical and numerical modeling of laser matter interaction experiments.
2007 – 2008
Visiting Scientist, Department of Astronomy, University of Maryland, College Park,

MD, USA - Filamentation during intense laser propagation in air.

1995 – 2003

Head of Plasma Physics Department, Soreq NRC, Israel - Modeling laser-plasma interaction experiments.

1994 - 1995

Visiting Scientist, AT&T Bell Laboratories, Holmdel, New Jersey, USA - Working on high harmonics generation in gases using high power sub-picosecond lasers.

1991 - 1994

Head of Plasma Physics Department, Soreq NRC, Israel - R&D activities in the area of high power laser produced plasma, including plasma diagnostics, material properties, x-ray lasers.

1987 - 1990

Researcher at Soreq NRC, Israel - Developing models on muon catalyzed fusion processes in the presence of strong electromagnetic fields.

1978 – 1987

Teaching Assistant, Racah Institute of Physics, Hebrew University, Jerusalem, Israel.

Brief description of my current research:

- Modeling of laser produced plasmas.

Laser produced plasmas are powerful sources of radiation in the x-ray region. Plasma spectroscopy is a powerful technique for measuring plasma parameters, such as electron and ion temperature and density, ionization state and composition. We are developing combined methods of atomic models and hydrodynamic codes joined with wide range of different experimental spectroscopic measurements to derive the plasma parameters.

- Laser propagation in air.

The physics of the propagation of intense (10^{13} – 10^{14} W/cm^2) short (100 fs) laser pulses in air is very rich, involving a variety of linear and non-linear processes, among them is a dynamic balance between self-focusing due to Kerr effect and defocusing by ionization, leading to self-sustained propagation of the laser pulse, with a plasma channel in its wake. Typical peak density of free electrons in these plasma channels is of the order of 10^{16} cm^{-3} and decays by more than an order of magnitude in less than 3

nanoseconds, introducing inherent limitation on the length of the high density plasma channel and potential conductivity based applications. Our recent studies focus on prolongation of the lifetime of these high density plasma channels.

- Particle acceleration during laser interaction with plasmas.

High intensity laser matter interactions at intensities $\geq 10^{18}$ W/cm^2 can produce fast electrons and protons of MeV energies with potential applications to laboratory astrophysics, cancer therapy and material science. We demonstrated recently notably enhanced proton acceleration by relatively modest ultrashort laser pulses and structured dynamical plasma targets, realized by special deposition of snow targets on sapphire substrates and using planned prepulses. We are currently working on further understanding and controlling this approach.