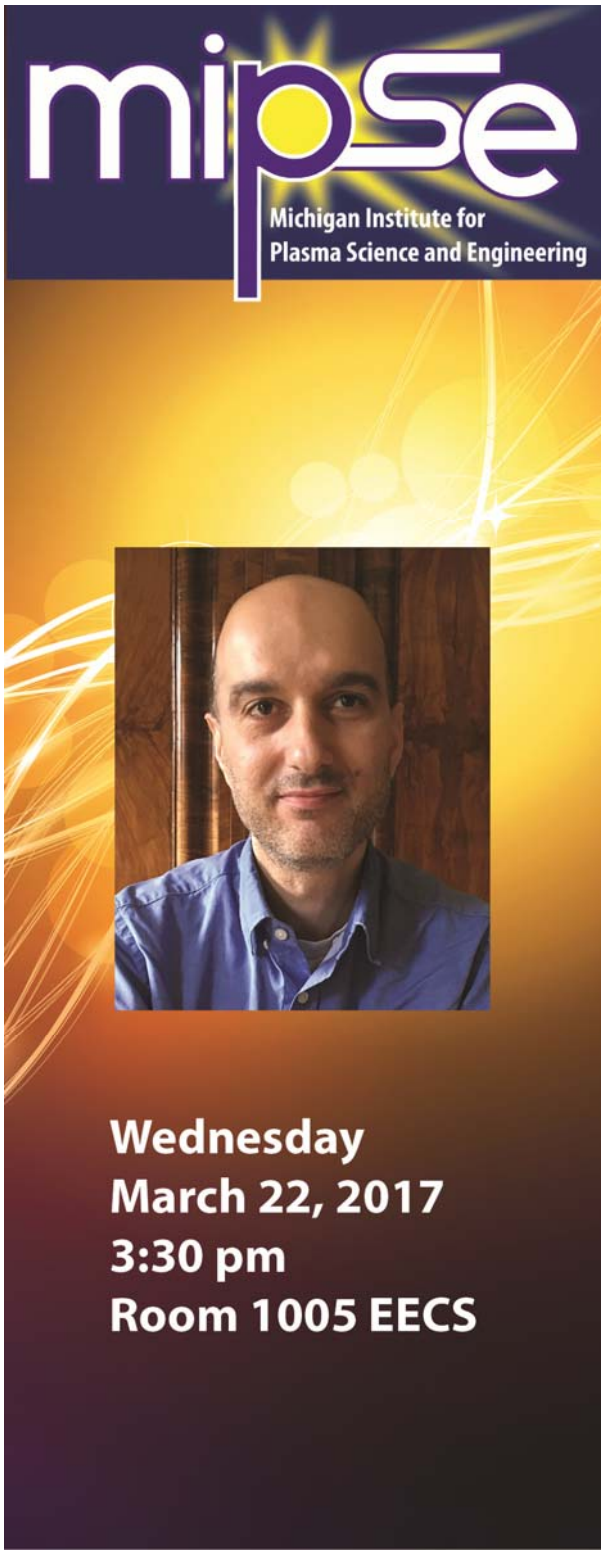

Prof. Gianluca Gregori

University of Oxford, UK

Magnetic Field Amplification by Turbulence in High-power Laser Experiments

Magnetic fields are ubiquitous in the Universe. Extragalactic disks, halos and clusters have shown, via diffuse radio-synchrotron emission and Faraday rotation, magnetic field strengths of few nG to tens of μG. The energy density of these fields is typically comparable to that of the fluid motion of the plasma in which they are embedded, making magnetic fields essential players in the dynamics of the luminous matter. The standard theoretical model for the origin of the magnetic fields is amplifying tiny seed fields via turbulent dynamos to the level consistent with observations. Since plausible cosmological seeds are orders of magnitude smaller than present-day magnetic fields, and the timescale on which turbulence winds the intergalactic plasma is comparable to the age of the Universe, it is unclear whether such large amplification can actually occur. Here we demonstrate, using laser-produced colliding plasma flows, that turbulence is indeed capable of rapidly amplifying seed fields to equipartition with the turbulent fluid motions. These results support the notion that turbulent dynamo is responsible for magnetization of the Universe.

About the Speaker: Prof. Gregori received his MS and PhD at the Univ. of Minnesota. From 2001-5 he was at the Natl. Ignition Facility of Lawrence Livermore Natl. Lab. He was a post-doctoral researcher 2001-3 and then staff scientist. Since 2005, he has been a senior experimental scientist at the Rutherford Appleton Lab (UK). In 2007, he received the 2007 Daiwa Adrian Prize for research in 'High energy density science: new frontiers in plasma physics'. Prof. Gregori joined the Dept. of Physics at Univ. of Oxford in 2007 as a RCUK Fellow. He became a Fellow and Tutor, and then Lecturer, of Physics at the college of Lady Margaret Hall in 2012. In 2013, he became Professor in Physics. In 2014 he received the Edouard Fabre prize for outstanding contributions to laser-produced plasmas. Since 2007 Prof. Gregori has led a group in high-energy-density laboratory astrophysics. He has more than 170 journal papers.