Call for applications for a PhD position
Laboratory of Excellence PLAS@PAR

Title of the PhD project: “Rotating turbulent dynamos”

Project description (Context and objectives of the project, possibly with 2-3 references)

Dynamo is the main mechanism for the generation and maintenance of magnetic fields in stars and planets. Observations, experiments and simulations have revealed that rotation is one of the key factors that determine the main characteristics of the observed magnetic fields. For example, fast rotating stars tend to have strong dipolar fields while weakly rotating stars have multi-polar fields of weaker strength. Although rotation clearly plays an important role in the dynamo process there is still a lack of theory quantitatively describing the different possible dynamo regimes as well as making a connection with the existing rotating MHD turbulence theory.

The objective of this PhD thesis is to investigate the dynamo mechanism under the effect of rotation and in which inertial, Alfvén and magnetoostrophic waves compete for dominance [1]. We propose to examine the dynamos produced by the different regimes of rotating MHD turbulence (weak and strong wave turbulence) and to classify the observed behaviour based on the control parameters of the system (Reynolds, Rossby or Prandtl numbers; degree of polarization). The work will lead to quantitative predictions about the scaling of observables (growth rate, turbulent spectra) with the rotation rate, the forcing amplitude and dissipation coefficients. As a final product of this study we will be able to make contact with astrophysical observations and experiments. The study will involve mainly computational works with three-dimensional direct numerical simulations in massively parallel computers, in a triply periodic box (TURBO code [2]) and in spherical shells (PaRoDy code [3]).

References:

Requirements for the candidate
The candidate is expected to hold a M.Sc. in Astrophysics or Plasma Physics and to have a first experience in numerical simulations.

Location and starting date
The PhD student will share her/his time between LPP (Palaiseau) and LRA/LERMA (Paris). The PhD will start on Oct 1st 2016.

The application should be sent by e-mail to the following contacts:
sebastien.galtier@lpp.polytechnique.fr
ludovic.petitdemange@lra.ens.fr

Applications with CV, statement of motivation, copies of degree diplomas and grades, two reference letters, and copies of any previous research-related work. Deadline is May 31st 2016.