A new fast ion source and detector for investigating the interaction of turbulence with supra-thermal ions in a simple magnetized toroidal plasma.

G. Plyushchev, H. Boehmer*, A. Diallo, A. Fasoli, I. Furno, W. W. Heidbrink*, B. Labit, M. McGrath, S. H. Muller, M. Podesta, F. M. Poli

Centre de Recherches en Physique des Plasmas, CRPP-EPFL, CH- 1015, Lausanne, Switzerland
* Department of Physics and Astronomy, University of California, Irvine, California 92697, USA

The interaction of supra-thermal ions and drift-wave turbulence remains one of the open questions in burning plasma physics. As the high density and temperature of tokamaks complicate the diagnostics, we plan to investigate this issue in a simple TORoidal Plasma Experiment (TORPEX), with R=1m, a=0.2m and a mainly toroidal magnetic field (<0.1T). TORPEX plasmas are characterized by electrostatic fluctuations and turbulence originating from drift-interchange instabilities. Due to the small plasma temperature (~5eV), a spatially localized, small-size ion source (~4cm) mounted inside the vacuum vessel, with relatively low ion energy (~100eV) can be used. The source consists of an aluminosilicate Li-6 ion emitter (6 mm diameter, 10-30μA current) installed on a 2D poloidally moving system. To investigate the influence of electrostatic turbulence on the fast ion dynamics, and that of the fast ions on the turbulence, the location, energy and current density profile of the ion beam will be measured using a 2D movable gridded energy analyzer. The analyzer should have a temporal and spatial resolution of 1ms and 5mm to resolve the beam profile, and a sufficient energy resolution (0.1eV) to observe phase space transport.