SORS: Hybrid modelling of the magnetoacoustic cyclotron instability in relation to ion cyclotron emission in D-T JET plasmas

Speaker: Leopoldo Carbajal

Abstract: Ion cyclotron emission (ICE) results from a radiative instability, probably the magnetoacoustic cyclotron instability (MCI), driven by energetic ion populations in tokamak plasmas, including fusion-born alpha-particles in JET and TFTR. ICE is a potential non-perturbative diagnostic for confined and lost fusion-born alpha-particles in ITER; furthermore, the MCI is representative of a class of collective instabilities, which may result in the partial channelling of the free energy of energetic ions into radiation, and away from collisional heating of the plasma. A deeper understanding of ICE thus of substantial practical interest for fusion, and the hybrid approximation for the plasma, where ions are treated as particles and electrons as a neutralising massless fluid, offers an attractive way forward.

In this talk I will present the latest results of our study of ICE in deuterium-tritium (D-T) JET plasmas using hybrid simulations of the MCI. These results provide fresh insights into the underlying physics of ICE in scenarios relevant to JET plasmas, and give further support to ICE to be exploited as a diagnostic for fusion-born alpha-particles in D-T plasmas in future fusion reactors.

Short Bio: Leopoldo Carbajal is a PhD candidate at the Centre for Fusion, Space and Astrophysics of the University of Warwick, United Kingdom. He obtained his MSc in Physics at the Institute of Nuclear Science of the Autonomous National University of Mexico in 2012.

During his PhD and previous work experience, Leopoldo has worked in a highly multidisciplinary environment, collaborating with people from important international research centres. During his MSc he spent three research stays at the Fusion Energy Division of the Oak Ridge National Laboratory (USA) as a visiting student. Shortly after finishing his MSc, he joined the multiphase flows group of the National Academy of Research and Development (ANIDE) in Cuernavaca, Mexico, where he worked developing numerical simulations of improved oil recovery methods, collaborating along with people from the Chemical and Petroleum Engineering Department of the University of Wyoming (USA). Current research projects where he provides simulation support include joint work with the Culham Centre for Fusion Energy (UK) and the Basic Plasma Science Facility at UCLA (USA). His current research areas include the study of radiative instabilities driven by ions in fusion and astrophysical plasmas, and numerical modelling of plasmas and fluids.