Contribution ID: **33** Type: **Contributed talk**

Nuclear Fusion and microwave heating

Abstract

Energy is the white gold of our era; it is precious and essential for a broad range of basic activities like cooking, heating, communications, food production, and transports. A sustainable energy source, i.e. at the same time reliable, clean, safe, and affordable, would then be the ideal solution to meet the needs of the global population in harmony with a farsighted preservation of the environment. Such optimal solution is already known and under development worldwide even though many technical and theoretical challenges still lay along the way toward its commercial exploitation: it is the nuclear fusion reaction. The main approach to fusion reactors is Magnetic Confinement Fusion (MCF); it envisages the confinement of a hot plasma using magnetic fields in two kinds of toroidal devices, Tokamaks and Stellarators, which mainly differ for the techniques employed to produce the confining field. Given their simplest, axial-symmetric geometry, the fusion community has so far mainly focused on Tokamaks, paving the way to the International Thermonuclear Experimental Reactor (ITER), currently under construction in Southern France, aiming at demonstrating the feasibility of a fusion power plant.
In both designs, the so-called ECRH is a fundamental system to provide the necessary heating to warm the plasma up to hundreds of millions of degrees Kelvin; it exploits the resonant absorption of microwaves from electrons in cyclotron motion along the magnetic field lines at the plasma centre. Injected microwaves can, nonetheless, be scattered at the plasma edge and decay in a wide zoology of daughter waves, of no interest for plasma heating and potentially dangerous for diagnostic systems; such process is known as Parametric Decay Instability (PDI). The survey of the drivers and of the properties of PDI can therefore provide a deeper insight in the physics of plasma/wave interaction, and reduce the power loss in fusion experiments due to scattered radiation.

Primary author: TANCETTI, Andrea (DTU - Techincal University of Denmark)

Presenter: TANCETTI, Andrea (DTU - Techincal University of Denmark)