Press Release
17 July, 2017

Efficient plasma heating using radio-frequency waves

IPFN researchers participate in large scale experiment exploring a new technique for generating energetic ions in fusion plasmas

An international team including IPFN researchers has found a new technique for the efficient heating of plasmas in nuclear fusion reactors using radio frequency waves. The results of this research, which is a large-scale collaboration between EU and USA scientists, will be published in *Nature Physics* this month.

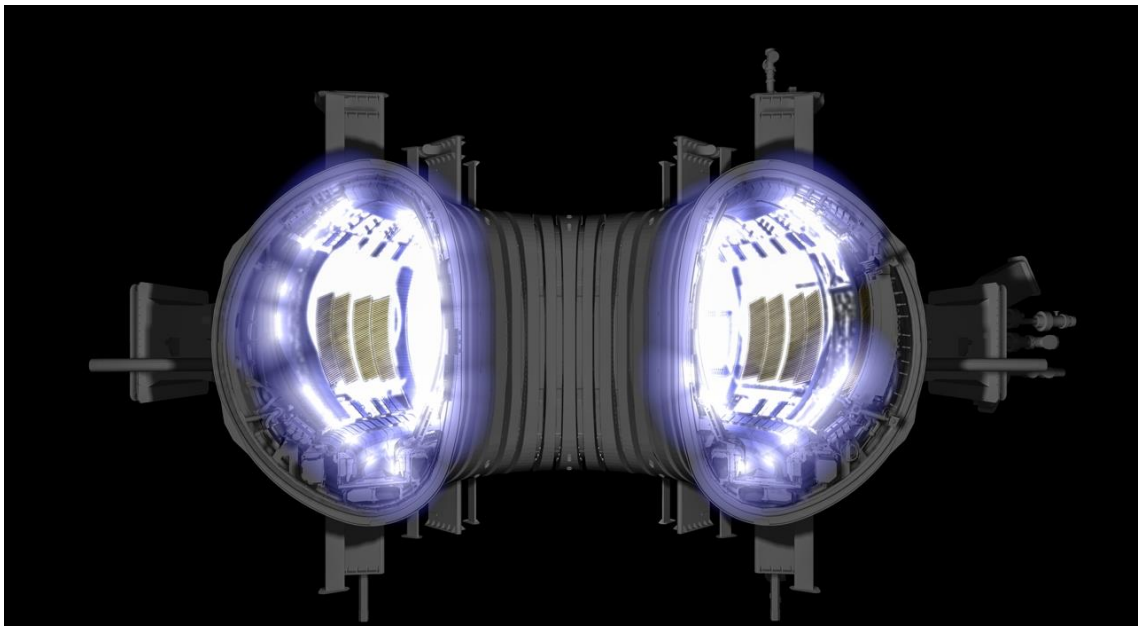
In nuclear fusion reactors, ion cyclotron resonance heating (ICRH) is a fundamental technique to increase the plasma temperature so that nuclear fusion reactions are prone to occur. In these experiments, the researchers demonstrated an efficient acceleration of Helium-3 ions to high energies in dedicated hydrogen–deuterium mixtures. As the fast Helium-3 ions are slowed down through collisions, the plasma heats up.

The potential of this new method has been successfully demonstrated in the world's largest nuclear fusion device, JET (Culham, UK), and in the high-magnetic-field tokamak Alcator C-Mod (Cambridge, USA). This demonstration represents an important step for future fusion reactors such as ITER and DEMO.

IPFN researchers Fernando Nabais and Filomena Nave were in charge of the experimental characterisation of the magnetohydrodynamic activity of the multi-ion plasma in the presence of the accelerated Helium-3 ions. Based on the analysis of the time evolution of the spectral power density and mode number of the observed magnetic fluctuations, they were able to identify the energetic ion-driven instabilities. Finally they used numerical codes developed at IPFN to model these instabilities, confirming the results observed.

Ye. O. Kazakov, J. Ongena, J. C. Wright, S. J. Wukitch et al., "Efficient generation of energetic ions in multi-ion plasmas by radio-frequency heating", Nature Physics, advance online publication, 19 June 2017

Link to the paper:
http://dx.doi.org/10.1038/nphys4167



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