Contribution ID: **54** Type: **Overview Poster**

OV/P-02: New Developments, Plasma Physics Regimes and Issues for the Ignitor Experiment

Monday, 8 October 2012 14:00 (4h 45m)

The IGNIR collaboration between Italy and Russia is centered on the construction of the core of the Ignitor machine in Italy and its installation and operation within the Triniti site (Troitsk). The scientific goal of the experiment is to approach for the first time, the ignition conditions of a magnetically confined D-T plasma. A parallel initiative has developed that integrates this program, involving the study of plasmas in which a high energy population is present, with ongoing research in high-energy astrophysics and with a theory effort involving the National Institute for High Mathematics and the Inter University Space Physics Consortium, CIFS. Innovations in the adopted diagnostic systems are expected from the collaboration with INAF, the National Institute for Astrophysics (X-ray diagnostics), with INFN (nuclear diagnostics), and with the University of Pisa. The Ignitor core construction has been fully funded by the Italian government and the management role for it has been assigned to INFN. Meanwhile, considerable attention has been devoted toward identifying the industrial groups with the facilities necessary to build the main machine components. An important step for the Ignitor program is the adoption of the superconducting material MgB2 for the largest poloidal field coils (P14) that is compatible with the He gas cooling system designed for the entire machine. The progress mode for the construction of these coils is described. The main physics issues that the Ignitor experiment is expected to face are analyzed considering the most recent developments in both experimental observations and theory of weakly collisional magnetically confined plasmas. Of special interest is the I-Regime that has been investigated in depth only recently and combines advanced confinement properties with a high degree of plasma purity. This is a promising alternative to the high density L-Regime that had been observed by the Alcator program and had motivated the Ignitor project. The provisions that are incorporated in the machine design in order to prevent the development of macroscopic instabilities with deleterious amplitudes are presented.

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Session Classification: Overview Posters

Track Classification: OV - Overviews