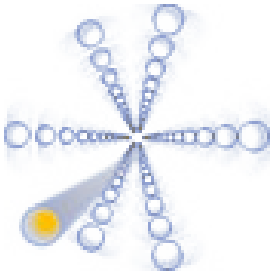

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# Magnetic Confinement Principles in Tokamak Devices and Actual Challenges

*Sunday, 5 October 2014 15:45 (45 minutes)*

After more than fifty research years on different implementations, the concept of the tokamak is a very good candidate to lead to a fusion reactor. In fact, certain regimes of functioning allow today the tokamaks to attain performances close to those requested by a reactor. However, these performances are acquired on extremely short duration only and means to acquire and maintain them are not always clearly identified. The general frame of this paper treats the perspective of a real-time control of tokamak plasmas in view to attaining continuous operation. This means to be able to maintain the plasma in a stable and quasi stationary state for several hours. It is also necessary to keep a sufficient efficiency so as to produce at least 10 times more energy than what is requested for the functioning of the tokamak. These extremely ambitious objectives are absolutely essential to get closer to a viable reactor and require first of all an experimental and theoretical understanding of the relevant physical phenomena. In fact, before defining any control algorithm, it is necessary to know the domains in which conditions are favorable to an increase of performances, while identifying the main actors responsible for this improvement. From a practical point of view, this objective of operation of a tokamak in continuous regime requires numerous technical developments, particularly from the point of view of the diagnostics which must be adapted to real time applications. This paper will underline particularly, on concrete examples, the impact of diagnostics on the identification of plasma models, on which the control algorithms are based.

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