Heating and Current Drive in ITER

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Attaining the $\sim 15\,keV$ plasma temperatures necessary for sustained fusion is no new achievement and has been demonstrated on multiple machines. In fact on some magnetic-confining devices (e.g. the Joint European Torus, Tokamak Fusion Test Reactor, etc.) fusion reactions have already been obtained and maintained for short periods of time. The next step in fusion research is to be able to sustain these Fusion conditions at steady-state or seemingly steady-state operation as with ITER ($\sim 1000\,sec$ pulses).

Therefore I propose to investigate ITER's current progress toward operating in steady-state as a test reactor examining specifically the heating process of a fusion relevant plasma. The use of of electron cyclotron resonant heating (ECRH), ion cyclotron resonant heating (ICRH), and neutral beam heating will be discussed as part of multiple stage heating technique where the combination of these are used to initialize the plasma temperature to fusion relevant temperatures before alpha heating takes over as the dominant factor. More emphasis will be placed on the subsequent stages of heating, where a steady-state or long pulsed operation is desired. Therefore investigation into Lower Hybrid Current Drive and work on using heating methods to maximize a high bootstrap current will be discussed.

References

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