ITER Operation without Tritium

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APPH 4990: ITER Seminar Project Proposal
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While the major goal of ITER is to achieve an "extended burn" of deuterium-tritium within inductively sustained discharges lasting more than eight minutes, ITER will require several years of non-nuclear operation. During this time, basic safety and licensing requirements will be established, and physicists will have the opportunity to explore a wide range of fusion confinement physics. As the world's premiere research facility for fusion energy, ITER can use fuel mixtures of deuterium and ^{3}He to explore physics of fusion dynamics at the reactor-scale without the activation caused by 14 MeV neutrons.

This project will review the non-nuclear operation of ITER and report on plans to develop high-performance discharges with hydrogen and helium that establish baseline discharge control and plasma diagnostics. In addition, ITER discharge targets using various fuel mixtures will be examined making estimates of (i) the relative concentrations of charged fusion products, (ii) fusion heating power profiles, and (iii) expectations of H-mode and plasma stability issues. Three specific case studies will be presented:

1. Fully non-nuclear operation with either full hydrogen or full ^{3}He discharges
2. Fusion nuclear properties of D-D ITER discharges
3. ITER plasma and fusion properties of D-^{3}He discharges as a function of the fuel mixture.

References

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