

Talk 1: DIII-D Research to Advance the Path toward Fusion Energy (03/07)

Fusion offers the prospect of limitless energy. But it comes with great scientific and technological challenges. This talk will outline the exciting research being performed on the DIII-D tokamak to help meet these challenges, and explain some examples of our research in more depth. DIII-D is the largest national facility in the US exploring magnetically confined fusion, and is organized as collaboration of many leading US laboratories and priorities, including UCSD. Our approach focuses on trying to understand underlying physical mechanisms that will govern behavior in future fusion plasmas, and how to manipulate them to deliver high performance stable plasmas that can be tamed to meet reactor needs. Our work targets both preparation for the ITER facility, a power plant scale experiment now being constructed in the south of France, and possibilities for fusion reactors and power plants before ITER. Challenges addressed include fundamental explorations of turbulence, stability, Alfvénic physics, and their application to understand the optimization of behavior in the core, edge and plasma exhaust. In this talk we will explore in particular how the plasma can develop large scale “3D” instabilities - deviations from the usual axisymmetric plasma structure, and how use of 3D magnetic fields coils can interact with the plasma to provide control. The talk will then go on to give an overview of other research to develop solutions for ITER and advanced tokamak path to steady state fusion.