TH/P2-16 · Strategies in Edge Plasma Simulation Using Adaptive Dynamic Nodalisation Techniques

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Abstract: Edge plasma steady-state and transient problems can be treated requiring accurate discretization techniques, like the propagation of sharp or abrupt changes of properties. The 2D-Fite Element mesh generator developed produces adaptive unstructured grids from flux surface characteristics. Finite Volume (FV) use such structured grids, and utilize recently adaptive unstructured grids for both Finite Element (FE) and FV methods as well. The initial mesh's quadrilateral elements are generated automatically and interactive generator extensions allow changes to edges following approximately equipotential lines and lines of slope. Element-connectivity-requirements of various solvers and propagation effects of refinement and coarsening are controlled. Methods of realignment are introduced to preserve refinement of front areas and alignment to the magnetic field. For common mesh handling features of FE/FV packages, variants have been added to the basic generation tool. Other enhancements include transition elements, triangular grid options which can be modified by the basic adaptation/realignment techniques, complex shapes can be treated this way.

TH/P3-01 · Edge Pedestal and E_r Layer Formation by X-transport in a Diverted Tokamak

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Abstract: X-transport is a non-tokamak type of collisional non-ambipolar transport localized to the X-region, caused by a lack of poloidal magnetic field. It is a baseline source of strong edge pedestal and Er-layer formation in a diverted tokamak. Since the last report, a new Monte Carlo guiding center code has been developed for a detailed study of the X-transport, including the plasma pedestal formation and flow development in the plasma edge. We will use the new results to shed light on many of the unresolved observations in the edge pedestal and H-mode experiments. Detailed physical processes in the density and temperature pedestal formation will be presented, among others. We will also compare the pedestal and E_r-layer formation (and implication to H-mode transitions) between a compact tokamak and an ordinary tokamak.

TH/P3-02 · Enhanced Confinement Phenomenology in Magnetic Fusion Plasmas: Is It Unique in Physics?

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Abstract: There is substantial experimental evidence that simple diffusive models for turbulent transport are insufficient to produce all the confinement phenomena observed in tokamaks. This paper reports on the emerging linkage between rapid, nonlocal, nondiffusive transport and overall confinement phenomenology including edge pedestals, enhanced confinement, ELMs, and internal transport barriers. Modern statistical physics techniques are used to construct simple models that generate many of the distinctive elements of global tokamak confinement phenomenology. The similarities are deep and are quantified. These results imply that current observations of avalanching transport in tokamaks may be deeply linked to the fundamental global features of tokamak plasma confinement.