

Fundamentals	[Fundamentals] - RF Heating and CD - Neutral Beams - Alpha Particles - Neutral Gas - Pellet Injection	[Fundamentals] - PIC-based - Vlasov-based - Electron Physics - Core + Edge	[Fundamentals] - 2-fluid - Hybrid PIC+fluid - Full Kinetic Ions - 2D + 3D Equilibria	[Fundamentals] - n, T, v, J, E _r evolution equations - Geometries: Axisymmetric & non-Grad-Hogan <i>t</i> evolution	[Fundamentals] - ab initio defect/impurity interactions - Bond Order Potentials - 3D Dislocation Dynamics - Fracture Mechanics	[Fundamentals] - Synthetic Diagnostics	[Fundamentals] - Parallel Data
<p>APPLICATIONS</p> <p>EXAMPLE Focused Integration Initiatives</p>	SOURCES	TURBULENCE	X-MHD	1 1/2 D TRANSPORT	MATERIALS	INTERPRETATION & ALGORITHMS	SOFTWARE ARCHITECTURES
PLASMA EDGE - First wall - Pedestal Physics - Edge Localized Modes - Open Field Lines - Divertor Ablation	- Wall Interaction - Neutral Gas - Atomic Physics	- Edge Turbulence Code (fluids based, and kinetics based) - Incl/ Capabilities for Open B -field Lines	- 2D or 3D Equilibria w/ Open Field Lines - ELM Physics	- Wall Models	- Sputtering and Vaporization - Corrosion and Compatibility - Helium Embrittlement	- Expt. Data Packaging - Predictor-corrector methods - Structured grid discretization	Define code modules Identify shared computation modules External data representations
TURBULENCE ON TRANSPORT TIMESCALES - Gyrokinetic Ions - Electron Physics - Evolve density, T	- RF H & CD - Neutral Beams	- PIC-based - Vlasov-based - Electron Physics - Core + Edge	- 2D & 3D Equilibria	- 1 1/2 D Solvers - Anomalous Heating and Diffusion	- Penetration - <i>Z_{eff}</i>	- Unstructured grid discretization - Adaptive mesh refinement - High-res and adaptive particle methods	Data location and transport services Metadata systems for large data management Design external interfaces for modules
ISLAND GROWTH - Sawtooth Growth - Neoclassical Tearing	- NTM Feedback - RF Stabilization of Island Sawteeth	- Kinetic Ion Model - Transport in Island Geometry - Fluid Electrons	- 3D Evolving (\underline{x}, t) Equilibria - Island Growth - Alpha-particle - driven Multi-Mode Resonances	- Model of Remainder of the Plasma	- <i>Z_{eff}</i>	- Fast solvers for Poisson's eqn. - Fast solvers for anisotropic transport - Integrated visualization and analysis tools	Select systems for - code archiving and management - configuration and building - testing frameworks
WHOLE DEVICE MODELING - Entire Discharge - Evolving (2D, 3D) Equilibria - Core + Edge - External Circuits	- Simplified Models of All Sources	- Simplified Models of Profile Transport (e.g., GLF23, MMM95) - Edge Model - Alpha-particle Scalar Convection - Alpha-particle Thermal Transport	- Simplified Models of Sawteeth and Islands - 2D and 3D Equilibria	- Circuit Equations & Feedback Systems - External Structures - Access to Expt. Data	- Penetration - <i>Z_{eff}</i>		

**INTER-OPERABLE
CODE CAPABILITY**