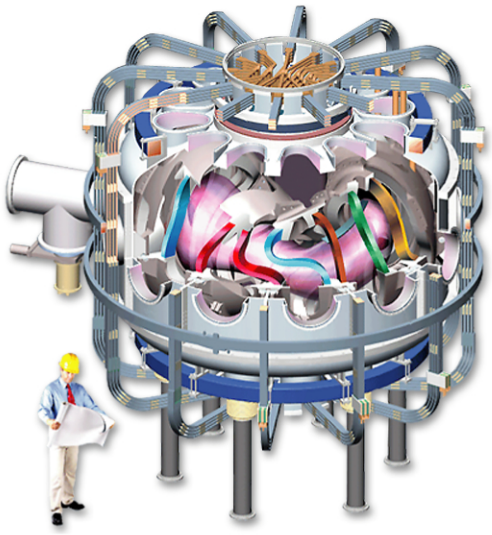
EES
Energy and Engineering Sciences

Fusion Energy Research

Oak Ridge National Laboratory is developing the understanding required for an attractive fusion energy source through integrated research, and is pursuing near-term applications of plasma science and technology in support of national goals. ORNL is a leader in innovative fusion concept development integrating our science, technology, and engineering activities.



Quasi-Poloidal Stellarator

Core Competencies

Experimental plasma physics

Performing topical research in plasma boundary physics, fueling and particle transport, confinement and stability, wave-plasma interactions, and concept innovation.

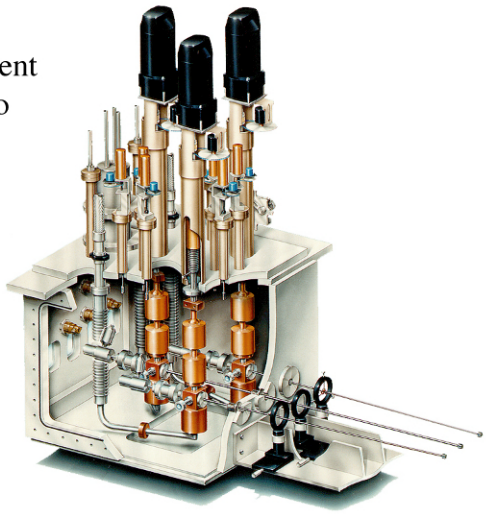
Plasma theory

Developing innovative plasma confinement configurations; advancing theory and modeling of plasma stability, collisional transport, and turbulent transport; and developing radio frequency heating to control an advanced confinement regime.

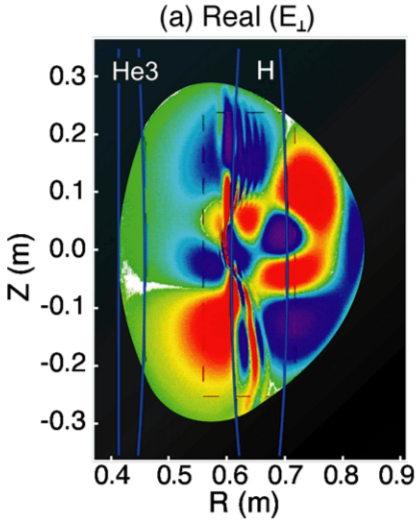
Enabling technologies

Developing plasma heating/current drive and fueling technologies to create, control, and understand high- temperature plasma.

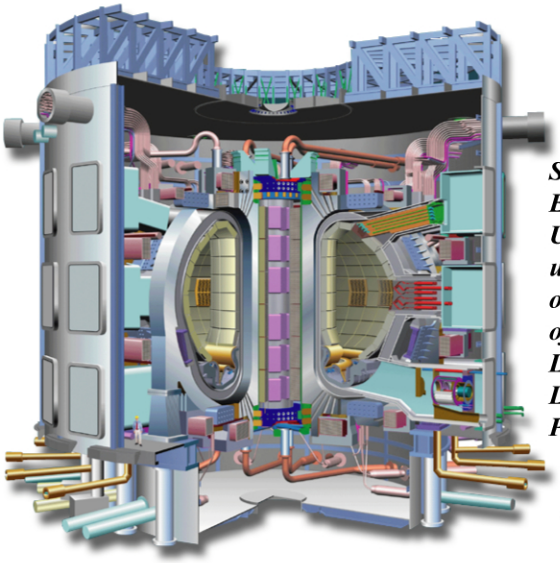
Advancing design and chamber technologies to help identify and resolve fusion reactor issues, for example, high power density, reliability/ availability/maintenance.



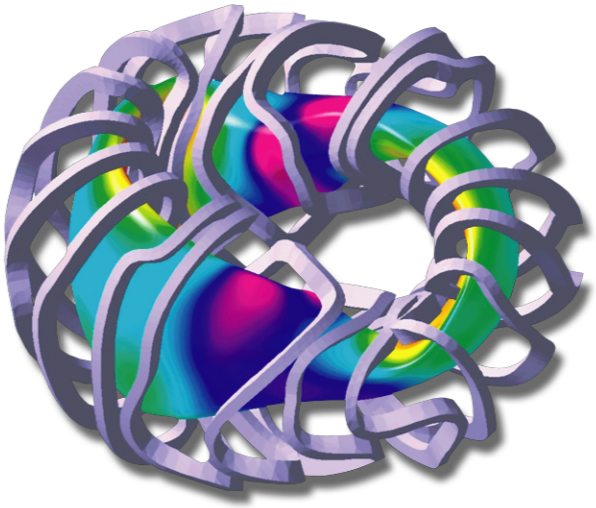
High-speed hydrogen pellet injector for fueling fusion devices



Mode conversion in a plasma cross section computed with AORSA2d code



Scientists and engineers from China, Europe, Japan, Korea, Russia, and the United States are working in an unprecedented international collaboration on the next major step for the development of fusion – ITER (which means "the way" in Latin). ORNL and Princeton Plasma Physics Laboratory are co-hosts for the U.S. ITER Project Office.



Quasi-Poloidal Stellarator flux surface and coils with |B| contours

Advanced materials

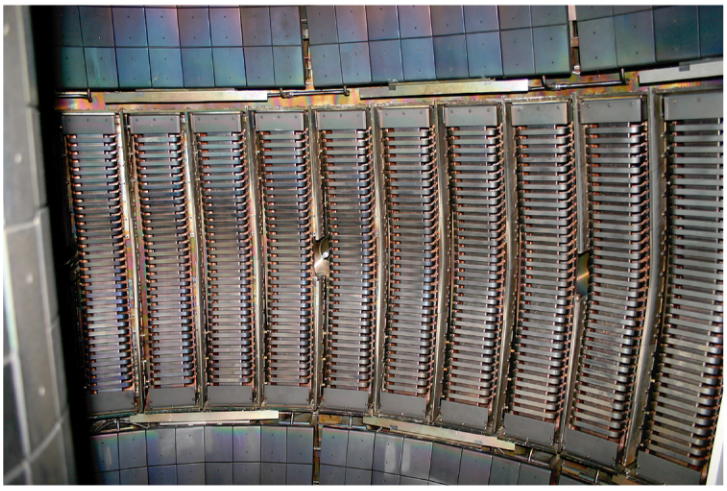
Advancing the materials science base to develop high-performance structural materials with attractive environmental and safety features.

Atomic physics for plasma science

Investigating atomic, molecular, and surface interactions to develop basic knowledge and needed data for plasma science.

Technology and science applications

Pursuing near-term applications of plasma science and technology in support of national goals.



Multi-megawatt radio frequency antenna for heating of plasma in a fusion device

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