

# PREFACE

## SPECIAL ISSUE ON ARIES-IFE

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This special issue includes the results of a 3-year integrated study of inertial fusion energy (IFE) chambers and chamber interfaces with the driver and target systems: the ARIES-IFE study.

During the past 15 years, the national ARIES Team has performed studies of magnetic confinement concepts to assess their economics, safety, and environmental potential as fusion power plants and to identify physics and technology areas with the highest leverage for fusion research. The Team performs detailed and integrated physics and engineering analyses using the most current and detailed models available and then uses the results to perform optimization and trade studies. Studies performed by the ARIES Team include ARIES-I through ARIES-IV; ARIES-RS, ARIES-AT, and Pulsar tokamaks; the ARIES-ST spherical torus; the TITAN reversed-field pinch; and the SPPS stellarator. The ARIES-IFE is the latest research by the ARIES Team.

As opposed to previous ARIES research, the ARIES-IFE did not focus on a single design point. Rather, the ARIES-IFE study aimed at identifying operational windows, trade-offs, and key physics and technology uncertainties for various IFE chamber concepts. Many combinations of drivers (lasers, heavy ions, Z-pinch), targets (direct and indirect drive), and chamber concepts (dry wall, thin-liquid protection, thick-liquid walls) can be envisioned for an IFE power plant. We have selected heavy-ion indirect target designs of Lawrence Livermore National Laboratory/Lawrence Berkeley Laboratory and direct-drive target designs of the Naval Research Laboratory as our reference targets as their photon and ions/debris spectra are vastly different. Three main classes of chamber concepts were analyzed including dry walls, solid structures with protective zones (e.g., wetted walls), and thick-liquid concepts. The operational window for each of these combinations of target and chamber has been studied.

The ARIES Team is a national effort and includes scientists from U.S. national laboratories, universities, and industry with strong international collaboration. The papers presented in this special issue benefit from contributions made by all scientists in the ARIES Team—who are acknowledged in the first paper by F. Najmabadi