Special Issue of Papers Originating from the 18th International Workshop on H-mode Physics and Transport Barriers (Princeton, USA, 2022)

Jerry Hughes, Guest Editor

This Special Issue of Nuclear Fusion collects papers from the 18th International Workshop on H-mode Physics and Transport Barriers, known more commonly as the "H-mode Workshop", which was jointly hosted 20—23 September 2022 by Princeton Plasma Physics Laboratory, Princeton University, Massachusetts Institute of Technology and General Atomics. The Workshop was held as a hybrid event, with the on-site activities based at Princeton's Andinger Center in Princeton, New Jersey, USA. This was the latest in a series of nominally biennial workshops beginning in 1987 and which have been hosted in a number of world locations (San Diego, Gut Ising, Abingdon, Naka, Princeton, Kloster Seeon, Oxford, Toki, St. Petersburg, Tsukuba, Fukuoka, Garching, Shanghai).

What is the purpose and scope of the H-mode Workshop? It provides an opportunity for magnetic fusion researchers to present and discuss their latest research on edge and internal transport barriers in plasma fusion devices, from both experimental and theoretical perspectives, as well as that of the modeling community. A strong emphasis is placed on communication, and ample time for group discussion is built into the schedule of plenary sessions. Early career researchers and PhD students mix freely with more experienced researchers, increasing the flow of ideas and creating brainstorming opportunities.

Poster sessions are the default mode for presenting contributed papers, and the in-person interactions at these posters is a highly prized aspect of the Workshop. When, in 2021, it appeared doubtful that the ongoing pandemic would allow an on-site event, the decision was made to delay the meeting one year and have subsequent meetings take place in even-numbered years. Participation in 2022 was strong, with 92 registered attendees, 63 of which attended on-site in Princeton. The on-site meeting was very productive and enjoyable, thanks to the efforts of the Local Organizers and Coordinators from PPPL, comprising R. Maingi, E. Kolemen, H. Munoz, A. Mills, and M. Ali. In addition to the regular technical sessions, the Princeton team arranged opportunities for wholesome social interaction which had been sorely missed at our professional meetings since early 2020.

To organize the Workshop, several key topics are chosen by our International Advisory Committee (IAC), which consisted of US co-chairs J. Hughes, R. Maingi and G. Staebler, and of L. Askinazi (Russia), E. de la Luna (EU), X. Gao (China), T.S. Hahm (Korea), K. Ida (Japan), H. Urano (Japan) and E. Wolfrum (EU). Under each of these topics the IAC invited an overview speaker to organize a plenary session including a summary talk on the present state of research into the topic and recent results. Contributed abstracts are categorized into these topics as well. The topics and overview speakers chosen for the 2022 Workshop were:

- Mechanism of Edge Transport Barrier Formation and Termination – *F. Koechl, United Kingdom Atomic Energy Authority, UK*

- Edge MHD and Turbulent Transport and their Impact on Pedestal, SOL and Divertor Heat Flux – *M. Kobayashi, National Institute for Fusion Science, Japan*
- Impact of Non-Axisymmetries on Confinement – *M. Willensdorfer, Max-Planck-Institute for Plasma Physics, Germany*
- Multi-Ion Species Impacts on Transport and Confinement – *J. Hillesheim, Commonwealth Fusion Systems, USA*
- Integration of Edge Transport Barriers with Radiative Scenarios – *L. Casali, University of Tennessee, USA*
- Internal Transport Barriers and Interactions with Edge – *Y.S. Na, Seoul National University, Korea*

This Special Issue features a selection of contributed papers from the Workshop, exploring topics of great significance to future burning plasma experiments and fusion pilot plants. On behalf of the IAC, I would like to convey my appreciation and gratitude to *Nuclear Fusion* for supporting their publication.