PREFACE

FOURTH ITER INTERNATIONAL SUMMER SCHOOL (2010)

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The fourth in the series of ITER International Summer Schools (IISS2010) was held May 31–June 4, 2010, on the campus of The University of Texas at Austin. IISS2010 was organized by the Institute for Fusion Studies and sponsored by the U.S. Burning Plasma Organization. The three previous ITER International Summer Schools had been held in Aix-en-Provence, France (2007 and 2009), and Fukuoka, Japan (2008). The purpose of the ITER International Summer Schools is to prepare young researchers for mastering the current and anticipated challenges of magnetic fusion devices and to spread the global knowledge required for a timely and competent exploitation of the ITER physics potential.

ITER (www.iter.org) is one of the largest and most ambitious international science projects ever undertaken in the world. Countries from seven ITER Members (China, the European Union, India, Japan, Korea, Russian Federation, and the United States), representing over half of the world's population, have joined forces to construct and operate the large-scale ITER experimental facility at a site in southern France. The objective of ITER is to demonstrate the feasibility of producing net energy from thermonuclear fusion reactions. It will push fusion physics and engineering into the regime of "burning plasmas," in which the nuclear reactions continue to fuel themselves with little or no externally supplied heating. Achieving this regime will cross a new scientific frontier.

"Magnetohydrodynamics and Plasma Control in Magnetic Fusion Devices" was the theme for IISS2010. The program of lectures covered the following range of topics:

- operations and profile control, advanced scenarios, control of burning, and long-pulse discharges
- using electron cyclotron heating and electron cyclotron current drive to control tokamak plasmas
- shape control
- disruptions and control of runaways
- control issues related to start-up
- sawtooth control
- avoidance and stabilization of neoclassical tearing modes
- magnetic feedback stabilization of resistive wall modes
- lessons from reversed field pinch on magnetic feedback control of tearing modes
- control of Alfvén instabilities
- hardware and algorithms for real-time control of instabilities
- mitigation and suppression of edge-localized modes by resonant magnetic perturbations
- lessons from stellarators on edge control through three-dimensional shaping
- error-field tolerance.

IISS2010 had a large attendance. The 20 lecturers came from 7 different countries (France, Germany, India, Italy, Japan, Switzerland, and the United States) and from the ITER Organization. The 133 participants were from 48 institutions in 17 countries (Brazil, China, Denmark, Finland, France, Germany, India, Ireland, Italy, Japan, Korea, Mexico, The Netherlands, Pakistan, Sweden, Switzerland, and the United States). The students at IISS2010 included graduate students, postgraduate students (postdoctoral), young researchers—and even two advanced high school students from a science magnet school in Oregon. About half of the lecturers and two-thirds of the students were from the United States. At the closing ceremony on the last day, everyone received a Certificate of Participation.

IISS2010 was held in facilities located on the campus of The University of Texas. The lectures, poster sessions,

Participants at the Fourth ITER International Summer School (2010)

and reception were held at the AT&T Conference Center, which also provided regular hotel rooms. Inexpensive rooms for students were provided at the San Jacinto Residence Hall. The computer laboratory sessions were held in Robert L. Moore Hall, the building that houses the Physics, Mathematics, and Astronomy Departments. And, the banquet—Texas barbeque and beer—was held in the Texas Memorial Museum.

Distinguished representatives at IISS2010's opening ceremony included Dr. Gary Johnson (Deputy Director-General, ITER Tokamak Department), who read written greetings from ITER Director-General Kaname Ikeda; Professor Richard Hazeltine, Chair of the Physics Department, The University of Texas; and Dr. James Truchard, CEO and President, National Instruments.

This was the first time ever that an ITER International Summer School had been held in the United States. Also for the first time at an ITER International Summer School, hands-on computer laboratory sessions were featured. Professor Gianmaria De Tomassi (University of Naples), an expert on the control system for the Joint European Torus (JET) device, taught four 1-hour classes about plasma control with XSCTools software. These sessions had an attendance of 67 participants.

We express our sincere appreciation to the highly qualified lecturers for their well-prepared and well-presented talks. This year, for the first time, the ITER International Summer School lectures are being published in *Fusion Science and Technology* (*FS&T*). We appreciate the significant assistance from its editor, Dr. Nermin Uckan. Of the 20 lectures, 13 are being published in this issue. The other seven lecturers considered that their lecture material had already been sufficiently described in other publications; these seven lectures are included as extended abstracts with references in Appendix A of this issue of *FS&T*. The actual lecture presentations, along with many photographs and other materials, are posted on IISS2010's Web site: http://w3fusion.ph.utexas.edu/ifs/iiss2010/.

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Finally, an acknowledgment is due members of the local organizing committee, who are from the Institute of Fusion Studies, The University of Texas at Austin:

- Dr. François L. Waelbroeck, for organizing the program of lectures, soliciting the lecturers, and arranging the computer laboratory sessions
- Professor C. Wendell Horton, Jr., for proposing that IISS2010 be held at The University of Texas
- Rita Wilkinson and Saralyn Stewart, for providing expert administrative assistance.

One of the speakers at the banquet, Dr. Juan Sanchez, Vice-President for Research, The University of Texas at Austin, commented to the students: "Fusion is the future, and the future is in your hands." This could well serve as the motto for all ITER International Summer Schools. And, with this special issue of *FS&T*, the lectures given at IISS2010 are now in your hands.