PREFACE

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The community associated with electron cyclotron (EC) emission (ECE) and heating and current drive (EC H&CD) technology and research for nuclear fusion applications is experiencing a phase of unprecedented success and of great promise for future developments. Not only are there several multimegawatt H&CD systems operating on a variety of devices (ASDEX-Upgrade, DIII-D, FTU, JT-60U, LHD, and TCV), but also the community is gearing up in preparation for the installation of even more powerful H&CD systems of 20 MW for ITER and 10 MW for the W7-X stellarator. This special issue on EC wave physics, technology, and applications marks this watershed moment with reports on results from the existing systems, in addition to the design work for the even more powerful next-generation H&CD systems.

The recent 14th Joint Workshop on Electron Cyclotron Emission and Electron Cyclotron Resonance Heating held on Santorini Island, Greece, in May 2006 was a catalyst for this special issue. The participants in the workshop along with others from the ECE and H&CD community around the world were invited to contribute to this special issue, with an aim to represent the global community and cover all the main issues pertaining to the H&CD systems, including technology, physics, theory, and ECE. The response was very positive, leading to nearly 50 accepted contributions forming two volumes, with representation from a dozen countries and about 20 different laboratories. Contributions related to technology cover all components "from plug to plasma" with submissions on the power supplies, gyrotron development, transmission systems, and several launching antenna systems for both present-day devices and for ITER. Scientific aspects associated with beam propagation and absorption in the plasma are well represented for various heating scenarios from O1 and X2 to electron Bernstein wave heating, successfully demonstrated on both MAST and TCV. The loop is closed with several contributions on ECE providing a return signal from the plasma for monitoring the location of the neoclassical tearing mode and inferring accurate plasma temperature profiles.

I am confident that this issue provides you the reader with a thorough and wide-ranging compendium of present-day ECE and H&CD. I hope that you will share my belief that the present success that we in the ECE and H&CD community are achieving proves that the technology and experience exist for moving forward to a new era with the construction of ITER and its 20-MW EC H&CD system.

In closing, I would like to thank all of the authors and reviewers who participated in this special issue. Also, I wish to thank the *Fusion Science and Technology* editor, Dr. Nermin Uckan, who has worked almost around the clock and always maintained a great amount of patience and enthusiasm in assembling this special issue. Julie Wilson, *FS&T* editorial assistant, is also thanked for her efforts in communication with all of the authors and referees.