PREFACE

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The present volume of *Fusion Science and Technology* (*FS&T*) is intended to provide an overview of the physics research program carried out at the Joint European Torus (JET) since the beginning of its exploitation in 1983. It, therefore, comprehensively summarizes the wealth of already published works and contributions at various venues, with a focus on key physics issues of direct relevance to next-generation tokamak fusion devices such as ITER.

JET, designed in the early 1970s, was built and operated until 1999 in the framework of a Joint Undertaking between EURATOM and its Associations in the member states. During this period the machine has been progressively modified to perform additional missions. A highlight of the performance achieved over that time window includes the world record of 16 MW of fusion power production using a deuterium-tritium fuel mixture. From the beginning in 1978, the strongly project-oriented activity at JET has been efficiently and effectively managed by the JET Joint Undertaking. At the end of the 1990s, the need emerged for an organization capable of increasing the intellectual diversity by directly involving on JET the entire European fusion scientific community. To this aim, from 2000 onward, the JET facilities are being collectively used by all the EURATOM member states under the European Fusion Development Agreement (EFDA).

The EFDA system has been successful in involving a large fraction of the scientific community working in the European fusion laboratories (29 laboratories today) in the scientific exploitation of JET: About 300 professionals are now involved in the JET activities. Such a large participation has noticeably extended the breadth of the JET physics program. In fact, since the beginning of EFDA, two main performance enhancement programs have been launched that have involved a large number of EURATOM Associations in the member states and played an important role in diffusing a common approach to the management of medium-sized projects.

This special issue on JET covers both the period of the JET Joint Undertaking and EFDA, trying to have a homogeneous presentation in spite of the important change in staff and organization that took place at the end of 1999. Since the coverage of JET data spans from 1984 to 2006, for the interest of the reader, more emphasis has been given to the more recent results originating from the EFDA period. As a consequence, it was chosen to have two introductory chapters: one from D. Palumbo (Honorary General Director Research, EURATOM) describing the events leading to the decision to build JET and one from the former JET Joint Undertaking directors to remind, in particular, the youngest readers about the main achievements of the JET Joint Undertaking and set up the scene for the more recent JET results. The following eight chapters have then been organized to review specific issues including H-mode scenarios, advanced tokamak scenarios, burning plasma physics, scrape-off layer physics, disruption studies, performance limiting magnetohydrodynamics, physics studies with the additional heating systems, and core transport studies, respectively. Finally, the last chapter summarizes some of the main highlights from the most recent period of JET, in particular, those leading to the present and future experiments in JET. The chapters have been prepared by a limited number of authors; however, each chapter is the result of the work of a much larger team of scientists and engineers. The members of the JET Team during the Joint Undertaking phase and EFDA-JET contributors and their affiliations are listed in the Appendix at the end of this issue.

In concluding, I would like to draw the reader's attention to the special role that JET will have during the ITER construction phase. JET is the device closest to ITER parameters and, until the upgrade of JT60-U into JT60-SA is completed, it will be the largest tokamak of its class in operation. Therefore, it would be the ideal machine where scientists who will collaborate on ITER could start working together to develop a common strategy on ITER scenarios, where natural leaderships may emerge and where researchers could be trained on how to operate a multi-mega-ampere device. It is my goal to further open JET to the participation of all the other ITER Parties.

I would like to take this opportunity to thank Claude Gormezano for the invaluable commitment and effort he

devoted to the difficult exercise of putting together this special issue. His experience and professionalism have been enormously beneficial and much appreciated. Moreover, I would like to express my acknowledgment to Richard Kamendje and Duarte Borba for their constructive work and support from conception to completion of this special issue, the many reviewers for their help in improving the quality of the papers, the editorial and production staff at the American Nuclear Society, and Lynda Lee at Culham Science Centre for her kind editorial help. Also, my sincere gratitude goes to Nermin Uckan, Editor of *FS&T*, for her support in accomplishing this special issue.