

# GUEST EDITOR'S COMMENTS

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The last decade has seen a rather remarkable expansion in the application of sophisticated controller design and analysis methods to tokamak control problems. Much of this has been driven by ever-increasing control performance demands in present experiments, but a great deal of work has also been motivated by the needs of detailed design projects for next-generation devices such as the Tokamak Physics Experiment (TPX) and the International Thermonuclear Experimental Reactor (ITER). The result of this effort has been that tokamak plasmas are more finely, reliably, and flexibly controlled in present-day devices than ever before, and the challenges of controlling long-pulse and igniting plasmas with superconducting coils will soon be met. Perhaps most exciting is that tokamak control is rapidly evolving from a physics task to an engineering task. This is certainly a reflection of the maturity of both physics understanding and the field of plasma control. More profoundly, however, it is a measure of the progress we have made along the path of fusion engineering toward a commercial reactor design.

In recognition of the interest in and success of tokamak control efforts in recent years, George Miley proposed this special issue of *Fusion Technology (FT)* on tokamak plasma control, which I have been privileged to help organize. The response to the initial invitation for contributions was quite remarkable, as the number of submissions significantly exceeded the number of original invitations. Accordingly, the present volume is the first of three volumes anticipated to comprise the special issue and includes control studies for many existing experiments as well as for TPX and ITER. The problems addressed include plasma equilibrium shape and stability control, fast equilibrium reconstruction for shape control, dynamic plasma response modeling, and specialized studies of disruption mitigation and avoidance control is-

ues. The international nature of the plasma control community is well reflected in the present collection of papers, which includes contributions from the Alcator C-Mod, Tokamak Fusion Test Reactor (TFTR), Princeton Beta Experiment Modification (PBX-M), and TPX programs in the United States; from the CREATE Consortium and the Tokamak Configuration Variable (TCV) Team of the European Union; and from the JT-60U Team of Japan. The second and third volumes will feature contributions with even broader international content and will include papers on ITER control requirements and design from the ITER Joint Central Team. Cutting-edge control topics such as neural network, fuzzy logic, and adaptive control applications to tokamaks will also be addressed in papers to be included in these volumes. It is our hope that the three volumes of this special issue will provide a thorough overview of the present status of tokamak control along with some fascinating views of advanced topics not yet in general use in the field.

I would like to express my gratitude to Prof. Miley for initiating the special issue and allowing me to contribute to its preparation. My thanks go also to the staff and editors of *FT* and in particular to Ms. Celia Elliott, whose tireless efforts have kept this special issue and the journal itself moving smoothly through the recent difficult months experienced by all those in the magnetic fusion community. Finally, I would like to acknowledge the work of the authors and reviewers of this large collection of papers. The preparation of this special issue tapped the resources of a significant fraction of the plasma control community and placed constraints of schedule, manuscript review, and manuscript revision on them occasionally beyond those usually required by journal submissions. I am deeply grateful for the patience and diligence of all the authors and reviewers who participated.