

Theory and Modeling

October 14, 2006

Since the first EAST IAC meeting, the theory group at ASIPP has made an extended effort in acquiring a suite of essential modeling codes for the design and analysis support of EAST's start-up campaign. However, ASIPP recognizes the need to strengthen theory and modeling support for EAST. Supporting initial startup has competed with the development of longer-term theory and modeling capabilities necessary to support the very interesting and challenging physics campaigns proposed for EAST in the next five years. The IAC proposes a strategy for the theory group to develop the theory, simulation and modeling capabilities to support EAST and China's participation in ITER through international collaboration.

The IAC suggests five scientific areas for concentrating theoretical resources in the near term. These are:

- (1) Model operating scenarios on EAST under the constraints of a superconducting tokamak.
- (2) Investigate edge and divertor performance, and particle and heat exhaust issues for long-pulse operation in various divertor configurations.
- (3) Evaluate the coupling of ICRF and LH waves to long-pulse H-mode plasmas, and utilization of RF for heating and current drive in different scenarios; also identify interesting regimes to study energetic particle physics utilizing ICRF and NBI
- (4) Model the changes of plasma performance with long time scale current profile evolution under non-inductive current drive conditions.
- (5) Investigate possible mechanisms for fast particle losses.

Long-term collaborations should be established to further develop Chinese participation in theory and first principle based modeling. As a start, a large assortment of modeling codes developed by the international theory community is available for EAST scientists. To expand this development, scientists should be sent to established institutions for extended periods. The committee has identified a number of opportunities that will make this possible. It is envisioned that these steps will foster a long-term collaborative network in fusion research.

Finally, we understand the shortage of fusion theory students in China has been recognized at a high level in the Chinese government, and we strongly support the development of actions to remedy the situation.