FESAC Panel Feedback to the ST Community
June 13, 2008

The FESAC Panel reviewed and discussed the content of the document: "Spherical Torus Community Input on Priorities, Gaps, and Opportunities of the U.S. ST Fusion Program for the ITER Era," and found it very informative and helpful to the Panel's work. The Panel has identified additional questions listed below, and recommends that the authors listed below consider leading the preparation of answers in the form of written "2-pagers" and submitting them by June 27, 2008 if possible to the web page: http://fusion.gat.com/tap/. Due to the large number of the questions and limited time available, the Panel further recommends that only the first three questions be addressed on June 30 at the upcoming FESAC Toroidal Alternate Panel meeting at Dallas (meeting details provided separately). Written inputs to this web page, jointly with or separately from these 2-pagers, are encouraged and welcome.

1) What are the essential features of the device that would fulfill the ST goal? Note that the Panel at present considers the CTF concept as a set of integrated capabilities that are useful as reference information. [co-authors: Brad Nelson, Charles Neumeyer, Roger Stoller]

2) What features make the ST preferable for this goal; what challenges need to be overcome to achieve it? [lead author: Aaron Sontag on behalf of STCC]

3) What intermediate steps are required? In particular,

    a. How would the ST program address and resolve the most crucial scientific questions ahead of it for this goal – startup/sustainment, transport and boundary physics? [co-authors: Roger Raman, Aaron Sontag; Bill Dorland, Dick Majeski; Rajesh Maingi, Prashant Valanju/Mike Kotschenreuther]

    b. How does the program envision reaching solutions for the technological issues associated with the goal – especially those particular to the ST approach – NBI, magnets, etc.? [co-authors: Larry Grisham, Jim Tsai; Brad Nelson]

4) How would the ST program address and resolve the following questions?

    a. Integrated scenarios with steady-state high heat flux and low collisionality: In case of using large NBI power, how does large rotation affect transport and stability, including momentum transport? In case of using large RF power, how should transport and stability be affected without driven rotation? What additional focus will be needed to deal with the more over-dense plasmas for the present and the ST goal? What are the scientific bases for these to extrapolate to the ST goal? [co-author: Masa Ono, Dave Gates]

    b. Macrostability: Are presently achievable and sustainable beta values sufficient to meet the requirements for the ITER-era goal? Are the scenarios for which these sustained beta values are achieved extrapolable to the ST goal? Are NTMs a

concern for the ST goal, and if so, what control tools are needed to avoid or stabilize these modes? More generally, which instabilities have to be tamed, and which primarily will be studied to improve the broader knowledge base? [co-author: Steve Sabbagh; Chris Hegna]

c. Fusion nuclear operations and tritium: Seems that the goal of a test facility is to develop solutions to these issues. Won't ITER experience produce sufficient knowledge base to operate this facility, including remote handling? Won't such a device need a lot of tritium to conduct meaningful tests? [co-authors: Tom Burgess, Alice Ying/Momahed Abdou]

5) Which of the scientific and technical questions are unique to the ST, and which are low-A extensions of well-known or well-studied tokamak physics? Where does research at low A help understand the physics of higher A? Where are the unique scientific features supplied by the ST that are broadly relevant? What issues will ITER answer that apply to the ST? [co-authors: Rob LaHaye; Stan Kaye]

6) In what ways will the R&D towards the ST goal, and the R&D using the ST goal facility, be relevant to the advancements towards an ST Demo? [lead author: Aaron Sontag on behalf of STCC]