Summary of BPO Modes of operation group for BPO Research Committee

M. Walker, R. Maingi – 7/9/13

A BPO working group on Modes of Operation for ITER was formed in 2012 to provide input to the ITER Organization (IO) to help the IO define how ITER will operate as an experimental device. Work in the group is conducted through a series of telephone conferences and began in earnest in late 2012. Early activities included hearing input from major stakeholders, including the US IPO and the IO. Through this process and internal discussions a decision was made to focus on three major areas of activity.

The first activity was to document data analysis workflows for specific examples of high-level between-shot analyses, one each from C-Mod, DIII-D, and NSTX. These advanced analysis tasks have been used to guide the conduct of specific experiments in these devices. An experiment on these devices typically represents a sequence of plasma discharges (often in a single experimental session) aimed at investigating various aspects of a particular plasma phenomenon. Between-pulse analysis allows some modification or refinement of the run plan based on what has been learned from previous pulses. For operation on ITER, this could translate to the adapted selection of pulse schedules from a set of previously validated set of pulse schedules with the aim of making the most effective use of run time. Moreover if multiple experiments are performed in a single pulse, each sub-experiment will require a set of validated pulse schedules, and the entire pulse will need validation to make sure one experiment isn't affected by changes to another. The sample tasks described below include gyrokinetic analysis (C-Mod), energetic particle instability analysis (DIII-D), and transport and confinement analysis (NSTX). Common workflow elements were identified, and the implied requirements for ITER were evaluated. While these tasks are presently carried out between pulses in US devices, processing of certain analysis elements that underpin more in-depth analysis concurrent with the ITER discharge will be needed to insure timely completion between ITER pulses.

The second was to document the entire experimentation procedure workflow for each of the C-Mod, DIII-D, and NSTX devices, from experiment conception through experiment execution, experimental data evaluation, and publication of scientific results. An experiment on these devices typically represents a sequence of plasma discharges (often in a single experimental session) aimed at investigating various aspects of a particular plasma phenomenon. A description of the workflows for each device was provided, along with a summary identifying common elements. In addition, a cursory summary of the implied requirements for ITER is provided. These workflows represent the processes used during a single experimental run year, or possibly two depending on whether major vessel openings were planned between run years.

These descriptions were delivered at the end of June to Axel Winter and Simon Pinches at the IO. The third activity, which has just begun, is to discuss and recommend possible procedures and policies for use of ITER as an experimental device.