Numerical simulation activities to support EAST experiments and CFETR physical design

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The Institute of Plasma Physics (ASIPP) and the US partners have a long history of collaboration on the numerical simulations for the tokamak devices. In the past two years, a lot of numerical simulation work are performed to support the EAST experiments and for the physical design of Chinese Fusion Engineering Test Reactor (CFETR). These collaboration work are using the simulation codes mainly developed by GA (OMFIT integrated modelling framework and a bunch of codes in it), PPPL (TRANSP, TSC and NOVA-K codes), LLNL (BOUT++ and CORSICA codes) and MIT (TORIC code).

On EAST, the plasma parameters of high performance long pulse discharge are predicted by TRANSP and ONETWO transport codes. Results show that with the power of 2 MW LHCD, 2 MW NBI and 2 MW ICRH the plasma can achieve steady state with betaN~1.8. Some simulation work also have been carried out to analyze the EAST experiments, such as the equilibrium reconstruction to include the constraints of internal magnetic field measured by the polarimeter-inferometer, the fast ion distribution calculation, the power deposition and driven current from LHCD and ICRH, the analysis of pedestal structure in EAST. Also, ASIPP scientists are deeply involved in the development of BOUT++ code, and used the code to study the heat flux on the divertor plate in EAST, and study the role of plasma rotation on edge localized modes.

For the CFETR physical design, a lot of work has been carried out by working with GA scientists and using the OMFIT integrated modelling tool. These work include the predictions of plasma performance of baseline operation scenario, by using the ONETWO/TGYRO and heating/CD modules; predictions of the pedestal structure by using the EPED model. Also, the whole discharge of CFETR baseline scenario is simulated with the TSC code.