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TECHNOLOGIES AND STATUS OF THE EAST TOKAMAK MACHINE

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The core of the EAST project in the engineering phase is to build a full superconducting tokamak with a non-circle cross-section of the vacuum vessel at the institute of plasma physics, the Chinese academy of sciences (ASIPP). The scientific and the engineering missions of the EAST project are to study physics issues of the advanced steady-state tokamak operations and to establish technology basis of full superconducting tokamaks. The basic physical and engineering features of EAST are: both superconducting toroidal field (TF) coils and poloidal field (PF) coils, continuous working (CW) non-inductive plasma current drive and heating systems, flexible and reliable PF system design to shape and control plasmas with big elongations and triangularity, real time data collection and feedback for steady-state profile control, active cooling and changeable plasma facing components (PFC) and advanced diagnostic measurements.

The significant progresses of a so-called pre-physics experimental program related to EAST have been achieved on the HT-7 superconducting tokamak, especially by achieving about 240 s long pulse in the operation campaign from April to June of 2004. The technologies of long pulse discharges for plasma initiation with low loop voltage, wall conditioning, plasma facing material, non-inductive current drive and heating, plasma control and data acquisition and processing have been developed very well. The R&D programs on EAST have been quite successful, which have been especially focusing on the EAST machine. Much attention had been paid on NbTi superconductivity engineering development, such as technologies of cable-in-conduit conductor (CICC) design, fabrication and test of sub-cables, short samples of CICC and model/prototype coils. Most of key fabrication procedures of superconducting magnets are carried by ASIPP. A 600 m CICC superconductor jacketing line, three special winding machines and a VPI facility had been developed and operating well at ASIPP from 2001. Up to February of 2005, total seventeen TF coils and thirteen PF coils have been fabricated, including one spare TF coil and central solenoid (CS) coil. All seventeen TF magnets with cases and joints and six CS coils have been tested and delivered to the EAST assembly site. The assembly of the machine has begun from 2003. It is planned to obtain the first plasma in 2005. The detail information of the key technologies and progress of the ESAT machine will be introduced in the paper.