ESTABLISHING AND RE-MEASURING THE INSTALLATION CONTROL REFERENCES OF EAST TOKAMAK

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EAST—Experimental Advanced Superconducting Tokamak

It was constructed by Institute of Plasma Physics, Chinese Academy Science in 2005. IMP was in charge of the establishing and re-measuring the installation control reference points for EAST assembling.

Features:
First fully supercon-ducing TOKAMAK consists of 16 TF coils (Bt=3.5T), 14 PF coils (ΔΦ > 10 VS).

Design goal:
Produce 1 MA plasma current; 1000s of plasma duration and 100M °C of plasma temperature.

Center reference pillar

1. To provide the platform for TCA2003 total station to measure the angles of each segments of torus.
2. To controlling the radial dimension and coaxiality of three tori as a measuring reference.

Installation Procedure

The bases assembly

The three tori assembly

The tori of VV, vacuum vessel TS and TF assembly procedure

The peripheral assembly procedure

Assembly tolerance:

- Height ±0.5mm; verticality ±0.5mm;
- coaxiality ±0.5mm; horizontal relative position ±1.0mm, horizontal angle ±36°

Measuring method and accuracy analysis

1. For a rotation control point:
   - Method: A observation sets of direction observation in results
   - Accuracy analysis (From Least平方F fitting error analysis)

2. For 32 angles elevation control points:
   - Method: A observation sets of direction observation in results
   - Accuracy analysis

Measuring Results

1. Angle deviation of the 32 angle control points

2. Height errors of the elevation reference:
The closest error is ±0.05mm with 10 elevation reference points, after 2 sets of closed traverse leveling.
Re-measuring Installation Control References in 2011

EAST assembly control references was established in 2003. EAST finished the installation work in 2005. First success discharge test finished on Sep. 2006. It passed the final acceptance by NDRC (National Development and Reform Committee) in 2007. Many years passed, the control references need to be re-measured and increase some control points, because they need the control references to replace in-vessel components every year.

Instrumentation: API T3 tracker; Leica DNA03

EAST 2012 Experimental Campaign Highlights

Significant progress has been made on EAST during the new experimental campaign on many physics and technology fronts, with the following key advances:
1. Achieved long pulse H-modes over 30 s with LHCD and ICRH, facilitated by active lithium (Li) and cryopumping.
2. Achieved long pulse divertor plasma up to 411s, which was fully driven by LHCD with active-cooled PFC and internal cryopump.
3. Achieved a long pulse Enhanced (EDA) H-mode regime and further verified the role of local ELMs on the L-H transition by high-aspect-ratio imaging.
4. Demonstrated changes in edge magnetic topology induced by LHCD, which have potentially significant impacts on divertor and edge physics, such as power deposition, edge rotation and L-H transition, etc.
5. Observed a loss L-H transition power threshold for the ion drift direction away from the dominant divertor on the RF heated discharge in EAST, opposite to the previous observations on other tokamaks.
6. Upgraded RF and LH systems to a total power of 8 MW, implemented more than 10 new diagnostics, and developed a new UV polynomials system and advanced stimulated Brillouin scattering (SBS) system for ELM mitigation and precise density feedback control.
7. Successfully demonstrated ELM control by LHCD power modulation, SnBn, D2 pellet and innovative Li pellet injection.

CONCLUSION

The installation control references of EAST were established in 2003, eight years passed, the references points are measured using laser tracker and the results show us that the deviations of the reference points changed a little, they are all in the acceptable tolerance. That tests and verifies the accuracy of installation control references established in 2003, and also verifies that the foundation of machine hall is very stable.