

The Preliminary Design of New Plasma Control System based on real-time Linux cluster for HL-2M

Tuesday, 6 July 2021 14:30 (10 minutes)

HL-2M is a medium-size tokamak constructed by Southwestern Institute of Physics (SWIP) in China. The first plasma has been successfully obtained in 2020 by using a plasma control system (PCS) based on Labview RT. In order to get better plasma control performance, a new PCS based on the software framework of DIII-D PCS has been proposed.

There are two concerns about realizing the PCS. First, real-time performance of PCS needs to be guaranteed. Second, many interfaces should be adopted for the HL-2M existing system. The proposed PCS is deployed on a Linux cluster with two servers, one is the non-real time server for message and waveform, the other is the real-time server with a D-TACQ196 DAQ card and two reflection memory(RFM) cards. The real-time operating system has been upgraded and optimized to improve real-time performance. Millions of testing results indicate that the jitter time of the system is less than $6\mu s$, which satisfies the system real-time requirement. In addition, EPICS has been introduced for message synchronization with Central Control System and other inherent systems. Meanwhile, RFM devices have been used to transfer real-time data in each control cycle. To extend the channel of data acquisition, D-TACQ2106 has been integrated into the new system. The initial system involves basic control algorithms (e.l., coil current control for CS and PF coils, density control and corresponding failure detection). The new PCS has been preliminary verified with HL-2M history data in simulation mode. It can output control command correctly in the integrated environment.

In the next phase, more control algorithms will be integrated and more tests will be carried out to verify system reliability.

Member State or IGO

China, People's Republic of

Speaker's Affiliation

1.Institute of Plasma Physics, Chinese Academy of Sciences, Hefei 2. University of Science and Technology of China, Hefei

Primary author: HUANG, zhongmin (ASIPP)

Co-authors: LI, BO; YUAN, Qiping; XIAO, Bingjia (Institute of Plasma Physics, Chinese Academy of Sciences); Prof. ZHENG, Guoyao; Mr HUANG, Junjie; ZHANG, RuiRui (Institute of Plasma Physics, Chinese Academy of Sciences); LU, Tiancheng; Mr ZHOU, Jian

Presenter: HUANG, zhongmin (ASIPP)

Session Classification: Plasma Control 2

Track Classification: Plasma Control