PROGRESS OF THE CONTROL SYSTEMS FOR THE ADS INJECTOR II

Yuhui Guo, Haitao Liu, Jing Wang, Jiangbo Luo, Yongpeng Wang, Zhiyong He,Ting Liu
Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou, China

1 Introduction

The Chinese Academy of Sciences initiated an accelerator driven sub-critical (ADS) program in 2011 under the frame of "Strategic Priority Research Program" for the objective of the safe disposal of nuclear waste as well as the potentials for advanced power generation. In an ADS system, the proton accelerator consists of two injectors ,each for the energy of 25 MeV, and a main accelerator which is designed for the energy of 250 MeV and the current of 10 mA (Fig. 1). A demo facility for Injector II has been manufactured in the Institute of Modern Physics of Chinese Academy of Science.

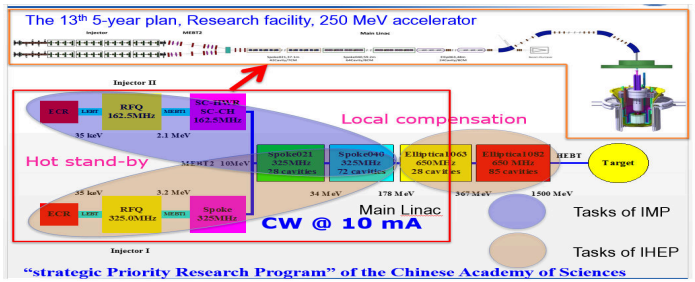

Fig. 1 Layout of SC Linac for China ADS facility

2 The overall architecture of control system

Injector II in the China ADS system includes an ECR ion source, a low-energy beam transport line (LEBT), a radio frequency quadrupole accelerator (RFQ), a medium energy beam transport line (MEBT), 4 crymodules and a diagnostics plate (Dplate).

Based on the Epics system architecture, a general three-layer control system(Fig.2) is constructed for the ADS injector II.

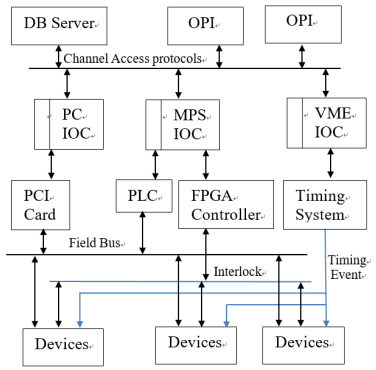

Fig. 2 Overall structure of control system

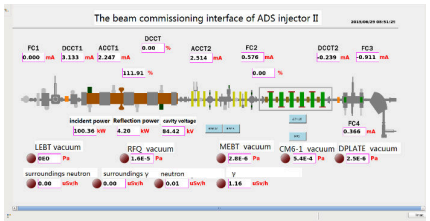

Fig. 3 The interface for beam commissioning

3 The control system's key devices includes:

Fig. 4 Left: The ion sources control system based on PLC of Siemens S7 series 300.

Fig.4 Right: The MPS control system, the mainly control logic codes run on the dual redundant RFC460R 3TX controller. When the main PLC goes down, the backup PLC will work immediately in several ms.

Fig. 5: The EVG (event generator) and EVR (event receiver) in timing system, which is provided by Shanghai institute of applied physics, Chinese Academy of Sciences.

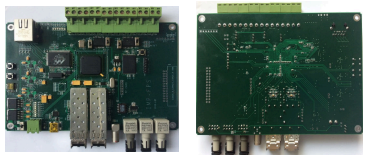

Fig.6: The fast machine protection controller based on FPGA and SFP. the time of the fault detection and the time of the feedback control should be within 10 us . The controller can protect the costly facilities such as RFQ and superconducting cavity from high energy beam damage.

4 The progress of the injector II control system

2014, where the subsystems, ECR+LEBT+RFQ+ MEBT + a testing crymodule that consists of one superconducting cavity, are tested. Furthermore, the proton beam commissioning with the energy of 5.3 MeV has been finished in the control room in June 2015, where the subsystems, ECR+LEBT+RFQ+ MEBT+ a crymodule that consists of 6 superconducting cavities, are tested. The beam commissioning with the maximum energy of 25 MeV will be taken in the near future.