



Contribution ID: 94

Type: Oral presentation

#03-94 Designed A Real-time Full-Range Digitizer for Neutron Flux Monitor On EAST

Wednesday, June 23, 2021 3:00 PM (20 minutes)

The neutron flux monitor (NFM) is a standard diagnostic for fusion neutron yield measurement on experimental advanced superconduct tokamak (EAST), and the neutron yield is a most important parameter to research of plasma auxiliary heating. After the upgrade of EAST, higher requirements for neutron flux measurements are put forward. Based on fast ADC (14bit, 500MSPS) and a high-performance FPGA, a four-channel real-time full-range digitizer for NFM was designed. In order to meet the requirement of fusion neutron flux wide-range measurement during high-parameter operation, the advantages of pulse counting modes, Campbell modes and current modes were combined to expand the dynamic range, so that the measuring range could reach 8 orders of magnitude. In addition to reduce the interference of gamma ray backgrounds on neutron flux measurements, a pulse signal processing technology was used to real-time distinguish between neutrons and gammas. Furthermore, to meet the requirements of mass data storage and high-speed transmission in the case of high neutron flux, a DDR3-based controller and PCIe bus technology-based DMA mode were separately designed. Moreover, a series of test were performed on laboratory and EAST device. Those test results have reached the expected design indicators, and the time resolution could reach 1ms, which proved the feasibility of NFM for EAST neutron flux measurements.

Primary author: YANG, Li (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science)

Co-authors: Prof. CAO, Hongrui (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science); Mr ZHAO, Jinlong (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science); Prof. ZHONG, Guoqiang (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science); Prof. HU, Liqun (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science); Mr WU, Guobin (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science); Mr ZHANG, Zihan (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science); Mr LI, Qiang (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science); Mr ZHANG, Yongqiang (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science); Mr ZHOU, Runhui (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science)

Presenter: YANG, Li (Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Science)

Session Classification: 03 Fusion Diagnostics and Technology

Track Classification: 03 Fusion Diagnostics and Technology