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8.4 Development for neutron emission spectroscopy diagnostics for EAST Deuterium operation

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Measurements of fusion neutron spectrometry is a useful diagnostic for DD neutron yield from 109 to 1015 n/s for EAST deuterium plasma discharges with NBI, LHWI, ICRF heating and their combination. A suite of compact neutron spectrometers, based on liquid scintillators and a stilbene crystal detector has been implemented on EAST for lower yield neutron measurements, and the ion temperature values were obtained from the deduced neutron spectra by a forward fitting method applied to the measured pulse height spectra. The neutron time-of-flight enhanced diagnostics (TOFED) spectrometer has been installed at the J port of EAST in order to study the behavior of fast ions. The new design is shown to enhance the discrimination capability and will provide fusion neutron spectra with reduced admixture of multiple scattering events. A new fully digital data acquisition system with on-board CFD timing function has been adopted and can provide a high count rate capability up to about 1 MHz/channel of the spectrometer. During the EAST 2017 summer campaign, synergized diagnostics from the TOFED and liquid scintillator spectral measurements were performed for the first time and the different components of neutron spectra are successfully separated at EAST plasmas with NBI heating.

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