

## P1.1003 Status of neutron emission spectroscopy diagnostics at the EAST tokamak

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See the full abstract here:

<http://ocs.ciemat.es/EPS2019ABS/pdf/P1.1003.pdf>

Measurements of fusion neutron spectrometry is one of the important diagnostics in EAST, with DD neutron yield from  $10^9$  to  $10^{15}$  n/s for deuterium plasma discharges with neutral beam injection, lower hybrid waves, ion cyclotron resonance frequency heating and their combination. A suite of compact neutron spectrometers, based on liquid scintillators (LSs) and a stilbene crystal detector has been installed and implemented on EAST for lower yield neutron measurements. The liquid scintillation and stilbene neutron spectrometers have been for the first time applied to successfully measure the neutron spectra for the low neutron yields 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 behaviour of fast ions produced by the injection of external auxiliary power. The new design, where the ring of second plastic scintillators (S2) is split into two spherical zones, is shown to enhance the discrimination capability and will provide fusion neutron spectra with reduced admixture of multiple scattering events, which is essential for increasing the sensitivity to weak components in the neutron emission. This system includes a total of 80 S2 plastic scintillators and a five-layered detector (S1) assembly coupled to photomultiplier tubes. A new fully digital data acquisition system with on-board CFD timing function has been adopted and can provide a time resolution  $<500$  ps, compatible with high count rate capability up to about 1 MHz/channel of the spectrometer. The energy resolution and detection efficiency of TOFED are about 6.6% and 1.8%, respectively. During the EAST 2017 and 2018 summer campaigns, synergized diagnostics from the TOFED and LS spectral measurements were performed for the first time, and the different components of neutron spectra and the velocity distributions of fast ions are successfully obtained at EAST plasmas with NBI heating.

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