Fast-Ion D-Alpha Spectrum during EAST neutral-beam heated plasmas

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Abstract. Based on the charge exchange recombination between fast ions and a neutral beam, fast ion features can be inferred from the Doppler shifted spectrum of Balmer-alpha light from energetic hydrogenic atoms. With the upgrade of the Experimental Advanced Superconducting Tokamak (EAST) in 2015, both co-current and counter-current neutral beam injectors have been available, and each can deliver 2-4 MW beam power with 50-80 keV beam energy. Based on the available probe beam, the fast ion D-alpha (FIDA) diagnostic system has been built [1] on EAST to investigate fast ion behavior. The system includes both tangential and vertical views to study the trapped and passing fast-ion velocity distribution and spatial profile. Beam modulation method is used here for background subtraction to get net FIDA signal. For the vertical view, the paired passive view is also available, allowing direct background subtraction. Since the FIDA diagnostic system was tested in the 2014 campaign, it has been updated to improve the reliability of the measurements, according to the mechanical problems. In the 2015 summer campaign, the validation of FIDA diagnostics is carried out under MHD-free neutral-beam heated plasmas, and the results for fast-ion D-alpha spectrum are compared with the simulated signals.

References

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