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4.31 Validation of fast-ion prompt loss measurements during neutral-beam heated plasmas on EAST*

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To investigate the fast-ions loss behaviour in high-performance plasmas on EAST, a scintillator-based fast-ion-loss detector (FILD) has been developed. The FILD has two measurement system, i.e. fast camera and photomultiplier tube (PMT) array. The fast camera can measure the pitch angle from 60° to 120° and the gyroradius from 10 mm to 180 mm of escaping fast ions reaching the detector, and the PMT detector is an array of 25 channels (5×5) and the sampling rate for PMT signal is 2 MHz per channel. In this paper, we will present the study of fast-ion prompt loss measurements with four different neutral beam (NB) lines together with prompt loss fast-ion orbit calculations. The transit time of the prompt loss orbit caused by the left co-injected NB is calculated to validate the diagnostic by comparing the simulation with the onset of fast-ion loss relative to the filtered fast ion D-alpha (f-FIDA) and the prompt loss distribution. By providing the pitch angles and gyro-radius of incident fast ions, we use the ion orbit loss model to calculate the trajectories of the incident ions backwardly in time to their birth at the intersection of the reverse orbit, and an overlaid NB injection footprint.

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