

17th Technical Meeting on Energetic Particles and Theory of Plasma Instabilities in Magnetic Confinement Fusion

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Fast-Ion losses during the current ramp-up and disruptions of the ASDEX Upgrade tokamak

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Beam ion losses have been observed in AUG discharges during the plasma current ramp-up phase and during disruptions. The velocity-space of the escaping, and accelerated, beam ions has been measured with the poloidal FIELD array available at AUG [1]. Tomographic reconstruction techniques [2] applied to the FIELD data revealed, with unprecedented detail, the velocity-space distribution of the lost ions. These reconstructions have shown that the losses during the ramp-up phase present a feature at energies greater than the NBI injection one. The accelerated lost beam ions are located in a narrow interval of gyroradii and have similar pitch angles than the non-accelerated prompt losses. For the disrupting discharges investigated here, there is an initial phase where the confinement of fast-ions is severely lost followed by another one where this confinement is recovered, before the termination of the plasma. During the phase of loss of fast-ion confinement, widely spread losses in pitch are detected; after it, the usual beam prompt losses (pitch and energy localized) reach the scintillator, as in HL-2A tokamak [3]. ASCOT [4] kinetic full-orbit simulations, will be done to assess the possible mechanisms leading to acceleration and pitch redistribution.

[1] M. Garcia-Munoz et al., Rev. Sci. Instrum. 80, 053503 (2009).

[2] J. Galdon-Quiroga et al., Plasma Phys. Control. Fusion 60, 105005 (2018)

[3] Y.P. Zhang et al 2015 Nucl. Fusion 55, 113024 (2015)

[4] E. Hirvijoki et al. Computer Phys Comm. 185 1310–132 (2014)

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