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Oral_3.2: Fast-Ion Loss Detectors in Magnetically Confined Fusion Devices

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In magnetically confined fusion reactors, energetic ions must be kept well confined until they slow down to the plasma bulk through Coulomb collisions. Energetic ions are, however, subject to a wide variety of cross-field transport due to their large velocities, long mean free path and slowing down times. Indeed, a broad spectrum of magnetohydrodynamic (MHD) fluctuations have been observed to cause a significant fast-ion transport / loss degrading their heating and current drive efficiency as well as the machine integrity. In general, in the presence of MHD fluctuations, the fast-ion cross-field transport depends on the properties of the MHD wave and particle orbits, and more specifically, on the perturbation´s phase at the particle´s position at any time. To characterize, and better understand, the MHD induced fast-ion transport, and loss, the community has developed a broad set of fast-ion loss diagnostics with the goal of covering the largest particle phase-space volume with Álfvenic time resolution. As expected, however, the ideal fast-ion loss diagnostic does not exist, and a combination of diagnostics is normally used in present devices to measure fast-ion losses. In this talk, the most advanced techniques will be briefly introduced and their capabilities and prospects for present and future devices discussed.

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