

Observation of Hole-Clump Pair Using an Upgraded E//B-NPA during TAE Burst in LHD

Friday, 6 September 2019 09:50 (25 minutes)

Toroidal Alfvén eigenmode (TAE) bursts are often observed in the low magnetic field ($B_t < 1\text{T}$) experiments in LHD with tangential neutral beam (NB) injection [1-4]. In order to measure the behavior of the energetic particles (EPs) during the TAE bursts, a tangential E-parallel-B type neutral particle analyzer (E//B-NPA) has been used. In the experiments with the E//B-NPA, the hole-clump pair formation was observed in the energy spectra of EPs. The observation indicates the radial transport of the EPs by the TAE bursts, and the energy of the clumped neutral particles were decreased after the bursts [3, 4]. During the TAE burst, the energy decrease which is much faster than the classical slowing down process was also observed by the NPA, but the detailed analysis was difficult due to the lack of time resolution. In order to investigate the behavior of the EPs during the burst, we have upgraded the E//B-NPA to improve its sampling time, which correspond to the minimum time resolution, down to 5 ns by adapting modern electronics to its measurement electronic circuits [5]. With this improvement, the energy change of hole-clump pairs were observed more clearly. It turned out that the clump appeared at high energy region and stayed at almost same energy at the initial phase of the burst. The large energy drop of the clump after the mode amplitude reached its maximum was observed more clearly than before. We will report the detailed investigation of the observed hole-clump pair.

[1] S. Yamamoto et al., Phys. Rev. Lett. 91, 2450001-1 (2003).

[2] K. Toi et al., Plasma Phys. Control. Fusion 46, S1 (2004).

[3] M. Osakabe et al., Nucl. Fusion 46 (2006) S911-S917.

[4] K. Ogawa et al., Nucl. Fusion 50 (2010) 084005.

[5] Y. Fujiwara et al., 3rd European Conference on Plasma Diagnostics P3.8 (2019).

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Session Classification: Plenary

Track Classification: Diagnostics for Energetic Particles