

§7.2. Observation of Clump and Hole Pair Creations with TAE-bursts on LHD

Osakabe, M., Yamamoto, S. (Osaka Univ.),
Takeiri, Y., Toi, K.

Observation of clump-formation with toroidal Alfvén Eigen (TAE) mode is recently reported in the energetic particle spectra on LHD [1]. The clumps are observed in tangential energetic neutral spectra and their energy ranges are located between 100 keV and 170 keV. The energy of the clump decays in time after the TAE-burst disappeared. The clump formation in the spectra is considered as the results of the enhanced radial transport of energetic particles which resonate with TAE-bursts and the decay is the results of the energy slowing-down of these radially transported energetic particles.

In addition to a clump formation, the formation of a hole with the burst is experimentally observed on LHD. Figure 1 shows an typical example of the clump and hole pair creation with a TAE-burst. In Fig.1(c), the tangential NPA-spectra are shown and the flux intensity is expressed by the brightness of the figure. At $t=0.576[s]$, an creation of clump, which correspond to an increase of the NPA flux, is observed with a TAE-burst and the energy of the clump decays in time as is indicated by a solid lines in the figure. Simultaneously, a creation of a hole, which corresponds to a decrease of the flux, is also observed. The energy of the hole also decays in time as is indicated by the dashed lines in the figure. The decay times of the clump and hole are 6[ms] and 8.3[ms], respectively. The location where the hole and the clump are created can be evaluate by comparing the decay time with the energy slowing down time of hydrogen particles. Figure 2 shows the slowing down time distribution on the NPA sight line. From this figure the location of the clump is identified to $\langle r/a \rangle_{orbit} \lesssim 1$,

while that of hole is to $\langle r/a \rangle_{orbit} \gtrsim 0.9$. This result clearly shows the radial transport of energetic particles by TAE-activities.

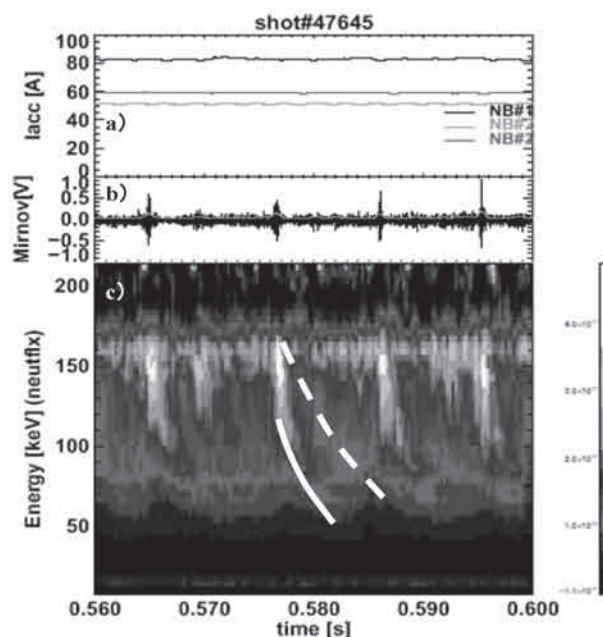


Fig.1 Typical examples of tangential NPA spectra where clump and hole pair creation with TAE-burst were observed. (a) NB signal, (b) Mirnov-coil signal, and (c) tangential NPA spectra are shown.

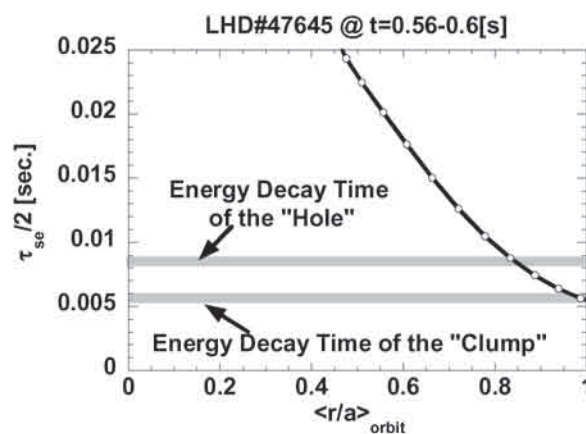


Fig.2 Energy slowing-down time of hydrogen particles which are circulating on the NPA sight line.

Reference

- [1] Osakabe, M., et al., Proceedings of 20th IAEA Fusion Energy Conference, Vilamoura, Portugal, 1-6 November 2004