§ 21. Interaction of Toroidicity Induced Alfvén Eigenmodes on Energetic Particles on LHD

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During the high-beta experiments with the magnetic filed of Bt=0.5~0.75 [T], the fast change of energetic neutral particles being associated with MHD burst signals were observed on the tangential Neutral Particle Analyzer (NPA). The signals of fast neutral particles of around 130-keV were increased when the MHD-bursts were observed. The signal increase of slower neutral particles occurred after the increase of the fast particles. This time delay was coming from the slowing-down time of the circulating particle whose orbit was changed with the interaction of MHD-bursts .

Figure 1(a) shows a typical waveform of MIRNOV-coil signal. The toroidal mode number of this burst is identified to be n=1 or 2. In Fig.1(b), the peak position of the increased neutral flux are plotted with open-circles at each energy channel of the NPA. Lines in the figure show the exponential fitted curve of the peak position, which has a 1/e-time of about 4.3[ms]. Comparing this decay time to the slowing-down time of particles whose orbits are tangent to the NPA line of sight, the increased particles are considered to be circulating on the orbit around ρ=0.55. For this orbit, the particle presence probability, which is evaluated from orbit-following calcuation, is shown in Fig.2(a), where "the particle presence probability" is defined by the ratio of "the time for a particle staying in a particular region of a plasma" to "the total amount of time being followed" in the orbit calculation. The shear Alfven-spectra are also shown in Fig.2(b). In these figures, it is sohwn that the peak of the particle presence probability distribution is locating at the gap for the TAE of n=2 and m=3. This shows that the energetic particles are influenced by TAE and those particle would change its orbit to a orbit which has the maximum particle presence probability around the TAE-gap location.

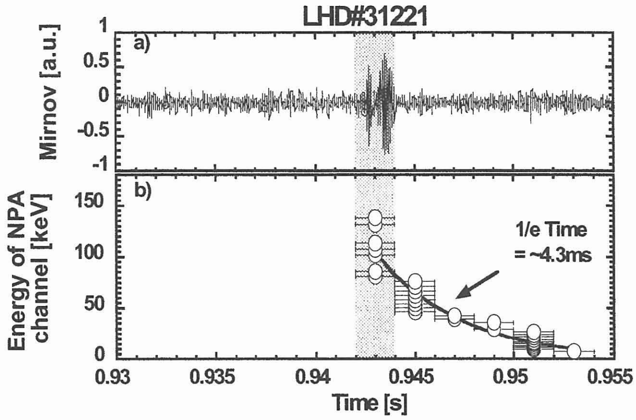

Fig.1 (a) A typical wave form of a MIRNOV burst signal being associated with NPA flux increase. (b) the peak position of increased neutral flux at each energy channel of a tangential NPA(open circles). Error-bars indicate the sampling duration time of the measurement. The solid line shows the exponential fitted curve of the peak positions.

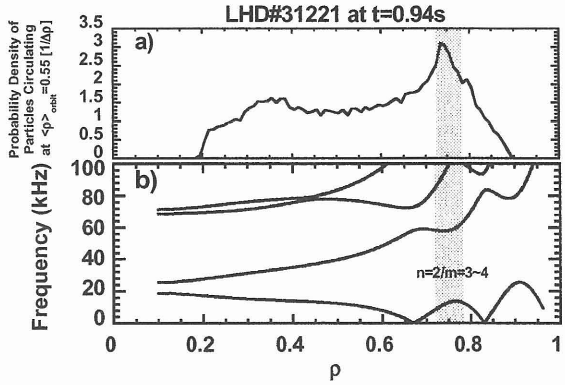

Fig.2 (a) Radial Distribution of Particle Presence Probability of the orbit which is circulating around ρ=0.55. (b) Shear-Alfven Spectra for n=2 at t=0.94.