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EX/P6-14: Frequency Jump Phenomena of e-Fishbone during High Power ECRH on HL-2A Tokamak

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It is important to carry out the experimental studies for the fishbone instabilities, which are relevant for understanding alpha particle dynamics in burning plasmas. The e-fishbone frequency jump related to the redistribution of the energetic electrons has been observed on Tore Supra with LHCD, which is important for the energetic particle losses. In this paper, the e-fishbone frequency jump phenomena with high power on axis ECRH on HL-2A will be reported. The new results are different from the phenomena on Tore-Supra, because the trapped particle is dominated in this case.

The frequency spectra of the soft x-ray shows that the frequency of the fluctuations is about 5 kHz in the low ECRH power and increases to about 8 kHz when the power increases to 1.2MW. The chirping mode during ECRH has been identified as the fishbone instability induced by energetic electrons in the previous investigation in the device. It is interested to study the nature of the frequency jump phenomena in the high power ECRH. The frequency jump can be observed, when ECRH power increases to about 0.7MW. The frequency jump phenomena appear within about 25ms periodically. The frequency jumps between 8 kHz and 15 kHz, when the power is 1.2MW. The evidence of the changes of poloidal wave number can be obtained by the results of the tomography of two soft x ray arrays. The results show that the modes are located q=1 surface and poloidal wave numbers are m=1 or 2. That means the mode changes between m/n=1/1 and m/n=2/2.

It is very important to understand the mechanism driven by both the passing particles and trapped particles, comparing with the e-fishbone features during LHCD. And it is also very important to study the instability with high power electron heating and the confinement of the energetic particles.

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