Study on ion cyclotron emission excited by DD fusion produced ions on JT-60U

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On JT-60U, ion cyclotron emissions (ICEs) which are related to deuterium-deuterium (DD) fusion produced fast ^{3}He (ICE(^{3}He)), T and H ions were detected [1]. The previous work shows that toroidal wavenumber and frequency of the ICE(^{3}He) observed in JT-60U are close to those based on the dispersion model of the magneto-acoustic cyclotron instability [2]. In this study, to understand its excitation mechanism, we have evaluated and compared the fast ^{3}He ion velocity distribution between the cases with and without the ICE(^{3}He) in a similar condition by using fast ion transport code OFMC [3]. To evaluate the velocity distribution of the beam-thermal fusion produced ions properly, we take into account effects of scattering-angle dependence of the fusion products on their birth energies and pitch angles. On JT-60U, the ICE(^{3}He) tended to become weak and disappear when negative-ion-sourced NB (N-NB) was injected [1]. Figure 1 shows evaluated energy and pitch angle distributions of the fast ^{3}He ions at the plasma edge on the low field side in the cases (a) without and (b) with the N-NB injection. In the case without the N-NB injection, the distribution has a bump-on tail structure in the energy direction. On the other hand, the distribution does not have the structure in the case with the N-NB injection. Relatively low energy ^{3}He ions that can reach the plasma edge are produced due to the N-NB injection. As a result, they eliminate the bump-on tail structure. Hence, the comparison implies that the ICE(^{3}He) is excited by the bump-on tail structure in the energy direction.

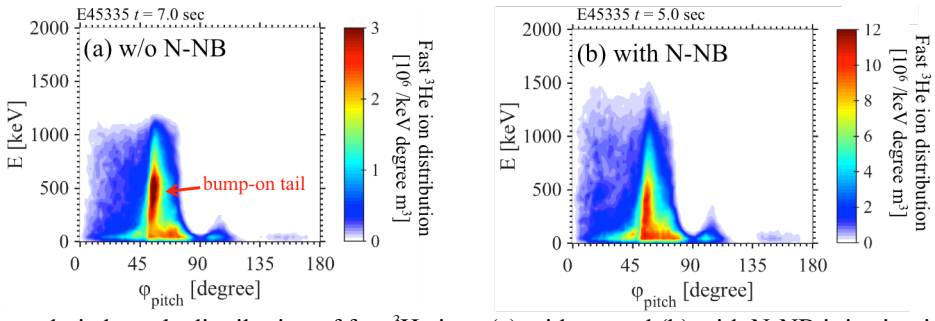

Fig.1. Energy and pitch angle distribution of fast ^{3}He ions (a) without and (b) with N-NB injection in E45335.

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