Comparison of Neon and Carbon spatial distribution in detached divertor plasma of H-mode discharge in JT-60U

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To reduce the heat load on the divertor plate, radiative divertor with impurity seeding has been investigated in fusion devices as one of promising solutions. However, it is still not yet well understood how a seeded impurity radiates under the presence of an intrinsic impurity. In this study, spatial distribution of a seeded impurity, neon, is investigated together with that of an intrinsic impurity, carbon, originating from carbon plasma-facing component of JT-60U. Here, measured distributions of neon and carbon emissions are compared with those calculated by SONIC divertor code, which can simulate impurity transport with a Monte-Carlo method.

Figure 1 (a) and (b) show, respectively, two-dimensional emission distributions of C IV 3s-3p (580 nm) calculated by SONIC for comparison to experimental measurement in the detached divertor plasma in a low heating power H-mode discharge of JT-60U. The emission distribution is calculated by SONIC preliminarily for a single impurity species. A similar preliminary calculation for neon ions has been also performed. As shown in Figure 1, the C II emission mainly emanates around the strike points while the C IV emission distributes along the divertor legs. Here, Line-integral emission of the calculated emissivity is compared with spectroscopic measurement in JT-60U.

Figure 2 shows comparison between line-integrated emissions of C IV along experimental viewing chords and those measured in the experiment. As shown in Figure 2, overall structure of the experimental C IV emission distribution is in agreement with the SONIC simulation.

This indicates that two-dimensional experimental C IV emission distribution is also probably well reproduced by the simulation, suggesting that SONIC can simulate transport and ionization/recombination process of C ions at a level of experimental agreement.

To investigate the transport for both neon and carbon, emission distributions with the SONIC simulation having both impurities will be compared with the experimental data.

References