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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[1] 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[2] 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.

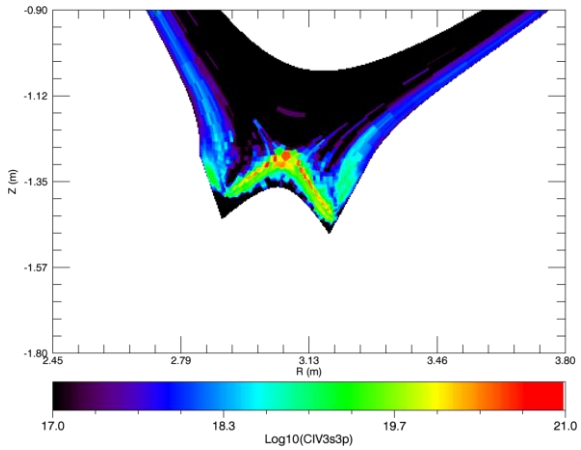

Figure 1 Simulated distributions of line emission of C IV 3s-3p (580 nm) in the JT-60U divertor geometry.

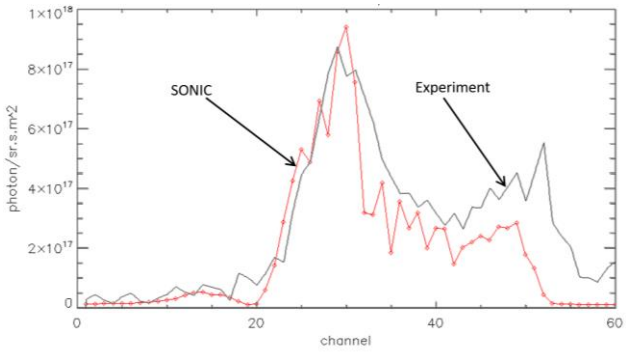

Figure 2 Comparison between line-integrated emission of C IV 3s-3p calculated by SONIC and experimental data of spectrometer in JT-60U.

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

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