Topic J	Requested: ☐ Oral ☒ Poster	Panel suggestion: ☐ Oral ☐ Poster

Quantitative Comparisons Between Experimentally Measured 2D Carbon Radiation and Monte Carlo Impurity Code Simulations*

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The MCI code is being used to develop a more complete understanding of carbon sputtering, transport and radiation in the divertor of the DIII–D tokamak. New sputtering modules have recently been installed in MCI to model chemical and physical sputtering. Using only physical sputtering (based on the Bohdansky_84 model)[1] the integrated carbon influx, in a typical attached DIII–D plasma, is 8.4×10^{19} neutrals/s. With both chemical and physical sputtering (based on the Roth_96 model)[2] the integrated carbon influx increased to 1.7×10^{21} neutrals/s and the average carbon concentration in the computational volume increased from 0.012% to 0.182%. This increase in the carbon inventory increases the radiated power in the divertor from 37 kW to 165 kW. DIII–D spectroscopic and bolometric measurements indicate that about 380 kW of the power radiated from the divertor region is due to carbon.

Four separate physical sputtering models are being used in MCI to drive the Roth chemical sputtering process. Each of these models are quantitatively compared with measured 2D carbon radiation distributions from the bolometer array. In addition, in order to help validate the models qualitative 2D carbon emissivity distributions from various charge states measured with the X–point TV system are being compared to the MCI simulations using each of the available sputtering options. The results indicate that the additional carbon supplied by the chemical sputtering process plays a significant role in cooling the divertor, particularly near and below the X–point. In order to fully test the sputtering and transport physics in the MCI code we are using sputtering yields from MCI in the UEDGE code and recalculating the background plasma. Through this iterative process between MCI and UEDGE we expect to be able to find much better agreements between both the qualitative 2D line emission distributions and the quantitative 2D total carbon radiation distributions with the MCI simulations.

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[1] Bohdansky, J., Nuclear Instr. Meth., **B2** 587 (1984).

[2] Roth, J. and García-Rosales, C., Nucl. Fusion **36** 1647 (1996).