Carbon transport in TCV

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Knowledge of the impurity transport parameters and their relation with those off the main plasma particles is important for predicting the fusion performance of a tokamak reactor and provides an element for validating comprehensive turbulent transport models currently under development. The radial profiles of fully ionized carbon released from TCV wall tiles were measured using an absolutely calibrated CXRS diagnostic. Experimental profiles of C^{6+} together with profiles of the carbon diffusion coefficient evaluated from the radial distribution of H and He like carbon lines were used to obtain the radial profiles of the all carbon ionization stages using the impurity transport code STRAHL.

Observations show that in stationary Ohmic and ECR heated L-mode discharges the profiles of carbon in confinement zone are always peaked and the STRAHL simulations unambiguously indicate the presence of inward pinch for carbon. In low current (edge safety factor $q_{95}>7$) Ohmic discharges the profiles of carbon are noticeably more peaked than electron density profiles. In discharges with factor $q_{95}<7$, for which the sawteeth are present in the plasma, the normalized carbon density profiles gradients become closer to those of normalized electron density profiles still remaining slightly higher in the confinement region. In Ohmic discharges the carbon profile peaking factor $n_C(0)/\langle n_C\rangle$, where $n_C(0)$ is the central carbon density and $\langle n_C\rangle$ is the volume average carbon density, follows the similar scaling with $\langle j\rangle/j_0q_0$ (j_0, q_0 is central current density and central edge safety factor respectively) as electron density peaking (see Fig. 1).

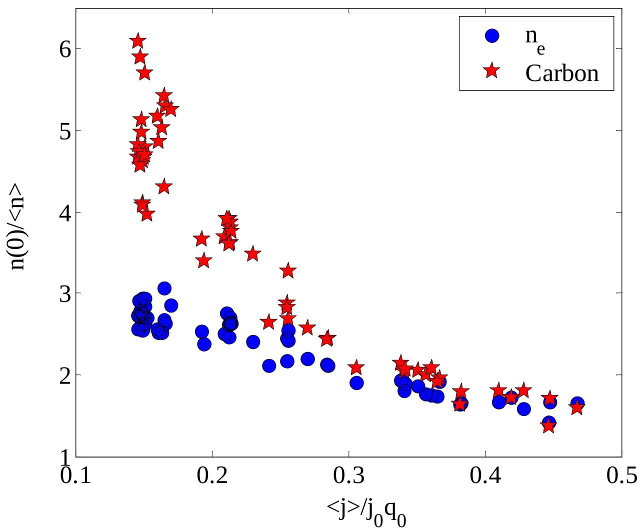

Fig. 1 Density peaking in Ohmic discharges as a function of parameter $\langle j\rangle/j_0q_0$ ($\langle j\rangle/j_0q_0 \sim 1/q_{95}$ in circular plasmas)