Future fusion devices such as ITER are envisioned to operate in the partially detached divertor conditions to reduce the peak heat load on the plasma-facing components (PFCS) while maintaining H-mode core confinement. During burning plasma operation, extrinsic impurity (such as Ne, Ar, etc.) seeding provided by a set of the toroidal gas valves will be applied in ITER. The dedicated argon seeded discharges have been performed on EAST tokamak. The four poloidally localized gas puffing valves are used in the experiments, which are located at the upper inner divertor, lower inner divertor, lower dome and lower outer divertor. The EUV spectrometer at D-port is employed to observe the line emission of the gas puffing argon. In this study, the 3D edge transport code EMC3-EIRENE is used to study the 3D impurity transport behavior in argon seeded EAST discharges.

EMC3-EIRENE Model:

Plasma:

\[
\nabla_i \cdot (n V_i) + \nabla_i \cdot (-D \nabla_i n) = S_i
\]

\[
\nabla_i \cdot (n m V_i \nabla_i n) - \eta_i \nabla_i V_i = \nabla_i \cdot (-m V_i D \nabla_i n - \eta_i V_i) = -\nabla_i p_i + S_m
\]

\[
V_i \cdot \left( \kappa_i \nabla_i T_i + \frac{5}{2} n T_i V_i \right) + \nabla_i \cdot \left( -\chi_i n \nabla_i T_i - \frac{5}{2} T_i D \nabla_i n \right) = k (T_i - T_{eg}) + S_{ne}
\]

\[
V_i \cdot \left( -\kappa_i \nabla_i T_i + \frac{5}{2} n T_i V_i \right) + \nabla_i \cdot \left( -\chi_i n \nabla_i T_i - \frac{5}{2} T_i D \nabla_i n \right) = k (T_i - L - T_{eg}) + S_{ne}
\]

Impurity:

Friction force

\[
\frac{dV}{dt} = \frac{1}{n_z} \frac{d}{ds} \left[ \frac{e \nabla E}{L} + \frac{V}{L} \frac{dV}{dt} + 0.71 \frac{d}{ds} \frac{dT}{dt} + 2.6 \frac{d}{ds} \frac{dT}{dt} \right]
\]