To investigate the impurity ion compression (impurity gas leakage from the divertor to plenum) and to understand the physics determining the impurity compression.


Impurity Ion Compression

- Motivation
  - To understand the physics determining the impurity compression
  - To investigate the impurity ion compression
    - Dependence on the bypass (leakage conductance)
    - Correlation with the impurity neutral compression

**Outline**

- Impurity Ion Compression Ratio
- C-Mod divertor bypass
- DIVIMP code
- DIVIMP modeling description

**Motivation**

- To understand the physics determining the impurity compression
  - Background plasma forces
  - Impurity gas leakage from the divertor plenum

**Impurity Ion Compression Ratio**

- The measure of impurity retention performance of divertor defined as
  \[ \frac{C_{\text{out}}}{C_{\text{in}}} = \frac{C_{\text{neutral}}}{C_{\text{ion}}} \]
  \[ \text{Impurity neutral density in divertor plenum} \]

- Experimental measurements of impurity neutral density in the plenum by RGA impurity ion density in the core plasma by high-resolution X-ray spectroscopy

**Background**

- Background plasma screening of impurity ions from penetration into the core plasma
- Bypass effect reduces the screening effect and drives the impurity ions toward the targets
- The open bypass provides the source of impurity penetration into the core plasma

**Conclusion**

- Frictional force is dominant over the temperature gradient forces and drives the impurity ions toward the targets
- The screening effect is reduced for both low density and higher density (detached) plasmas
- Impurity ion compression is not affected by leakage conductance and uncorrelated with the impurity neutral compression

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