**ICRF induced edge plasma convection in ASDEX Upgrade**

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**Motivation**

- Edge Ion Cyclotron Range of Frequency (ICRF) fields
- Large inhomogeneous sheath rectified potentials in front of the antennas
- Significant E×B convective transport, hot spots, impurity generation and power dissipation [1].

The convective transport can modify the edge density and influence the coupling of the ICRF power. The hot spots may damage the antennas and surrounding structures.

Thus it is critical important to investigate these drifts induced by the edge ICRF fields. Theory and numerical studies are needed to understand and predict the SOL modifications caused by these drifts.

**Benchmark of prescribed drifts**

The EMC3 equations [2] including the particle, momentum, electron and ion energy transport equations.

Prescribed drift terms added to the emc3 equations.

\[ V = \left( x E_y + y E_x + z E_z - D_y b_z - D_z b_y - V_{th} \right) S_n \]

\[ V = \left( n x E_y + n y E_x + n z E_z - g \phi - D_y b_z - D_z b_y - V_{th} \right) S_n \]

\[ \frac{1}{2} z^2 (E_x b_z + E_z b_x - 2 \phi b_z) \]

\[ \frac{1}{2} z^2 (E_x b_z + E_z b_x - 2 \phi b_z) \]

\[ z^2 (E_x b_z + E_z b_x - 2 \phi b_z) \]

Conclusions

1. For the first time we have added the prescribed drift terms to the particle, momentum, and energy transport equations in the EMC3-Eirene code and benchmarked the 3D code results against the analytical ones in a cylindrical geometry.

2. For the first time we have calculated the RF sheath rectified potentials, the electric fields and the drift velocities in 3D geometry, and simulated the ICRF induced SOL modifications in ASDEX Upgrade.

3. The ExB drifts caused by the rapid variation of the potential across the magnetic field will result in edge plasma convection. The RF convection tends to drive the edge plasma outward and flatten the SOL profiles through the formation of pump-out structures.

4. Further simulations and experiments in AUG will give more accurate characterisation of the ICRF induced SOL modifications.