

## Modification of Resonant Magnetic Perturbations on Edge Poloidal Shear Flow and Turbulence Structure on the HL-2A Tokamak

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Edge poloidal shear flow (also the electric field) is the key to understand L-H transition and turbulence transport in magnetic confinement devices, especially in the future fusion reactors like ITER. Improved diagnostics allow us to study it in a larger measurement range and better spatial and time resolutions. GPI diagnostic on HL-2A tokamak is used to investigate the impact of the RMP on the poloidal turbulence transport properties in the edge and the SOL, mainly focusing on poloidal flow and density fluctuations. We observe that RMP have significant impact on both poloidal flows and turbulence structures properties when the RMP coils currents exceed the threshold (4 kA) as shown in Figure 1.

When  $I_{RMP}$  exceeds 4 kA, the inversion point of poloidal velocity (layer I) start to shift further inside. A maximal moving distance of 4 cm is realized when  $I_{RMP}=4.7$  kA. The edge potential start to increases from 650 ms ( $I_{RMP}=4$  kA), and the potential turns to positive during  $I_{RMP}$  equals to 4.7 kA time period. This modification is explained by increased electron loss along the disturbed radial magnetic field line when RMP are applied, and the increase of boundary potential and the change of radial electric field provide strong experimental evidence.

The wave number spectrum also changes from quasisymmetric to significantly up-down asymmetric, which indicate that turbulent structures are stretched with a tilted angle. With the application of RMP, longer-lifetime and larger-size blobs are detected in the far SOL and they may cause a more serious erosion problem to the first wall. Thus, enhanced blob propagations in the SOL with the application of RMP needs to be considered for the ITER design work and future operations.

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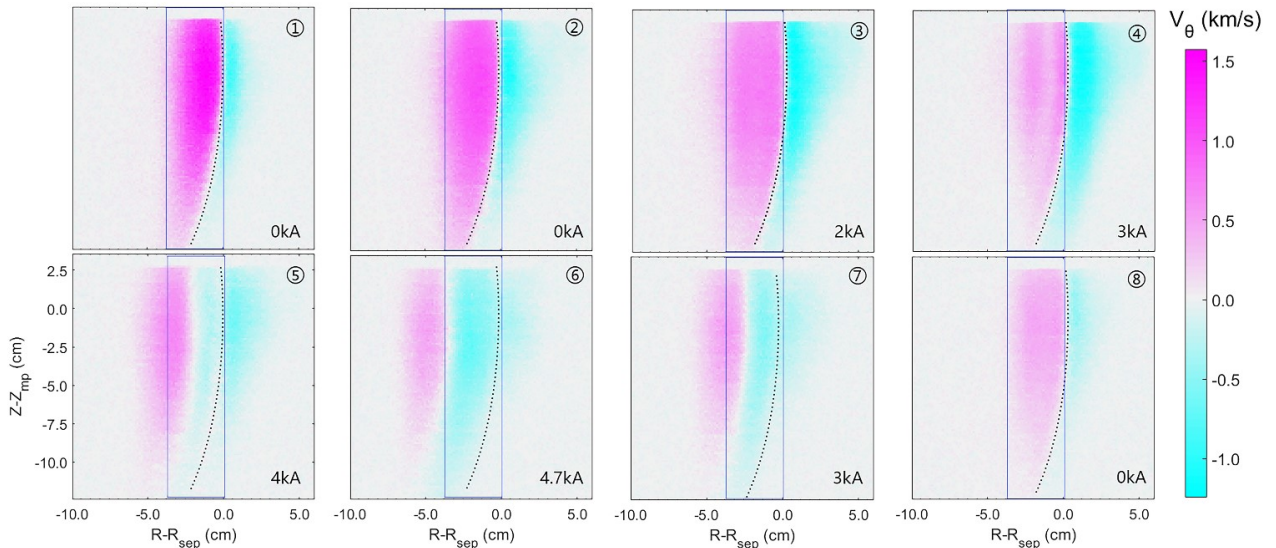


Figure 1. Average poloidal velocity ( $V_\theta$ ) fields with different  $I_{RMP}$ . The black dotted line is the separatrix. The applied RMP coils current values are marked at the corner of every sub-figure. The application of RMP is observed to modify the poloidal velocity significantly. When  $I_{RMP}$  exceeds 4 kA, the turbulence poloidal velocity in the edge changes direction from electron to ion diamagnetic drift.