Contribution ID: **3714** Type: **not specified**

P2.1017 Active divertor flux control by the supersonic molecular beam injectionwith magnetic perturbations induced by lower hybrid waves on EAST

Tuesday, 9 July 2019 14:00 (2 hours)

See the full abstract here http://ocs.ciemat.es/EPS2019ABS/pdf/P2.1017.pdf

A serious challenge for high-power long-pulse operations of the tokamak is how to prevent damage to the plasma-facing components by particles from the edge plasma. Recently, a potential actuator to control the divertor flux distribution by using the synergy of the supersonic molecular beam injection (SMBI) and magnetic perturbations induced by lower hybrid waves (LHWs) [1–3] has been observed on EAST experiments [4]. To reveal the physical mechanism behind, first simulations with good qualitative agreements to the experimental findings are per-formed by utilizing a fluid 3D edge plasma Monte-Carlo code (EMC3) [5] self-consistently coupled to a kinetic neutral particle transport code (EIRENE) [6, 7]. The redistribution of the divertor flux is more pronounced with an increase in either the SMBI injection rate or the LHW input power. The ions and electrons originating from the ionization of injected neutral particles in the plasma edge flow along the magnetic flux tube towards the divertor, thus directly increasing the divertor flux on the split strike lines in the footprint. Combining this with the multi-lobe structure of the edge magnetic topology, actively controlling the divertor flux can be realized by adjusting the SMBI position or the phase of the magnetic perturbations.

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Presenter: XU, S. (EPS 2019)

Session Classification: Poster P2