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PD/P8-17: Controlled Plasmoid Ejection from Spherical Tokamak Plasmas for the Dynamic Divertor

Friday, 12 October 2012 14:00 (4h 45m)

We demonstrated periodic ejections of "plasmoid" -closed magnetic island- from the main tokamak plasma, its transportation and reconnection with a divertor plate by our TS-4 spherical tokamak experiment and 2-D MHD simulation. These are key results for a new "Dynamic divertor"whose unique magnetic separation of divertor plasma is expected to significantly reduce heat flux to the divertor plate. The divertor is a key component for fusion reactors to remove helium ash with heat flux from the main plasma. The severe heat load limitation for the divertor plate can tolerates the grassy (small) ELM (Edge Localized Mode) but not the Type-I ELM, regulating the high-beta tokamak operation. The super-X type and the snowflake type divertors increase the wetted divertor plate area to reduce the heat load by factor 2-3. Unlike these innovative divertors, the dynamic divertor has the magnetically isolated divertor plate, which is indirectly and periodically connected with the SOL plasma by the plasmoid ejected from the main plasma. The magnetic isolation and radiation cooling of the isolated plasmoid by Argon gas puff or impurity pellet injection are expected to reduce heat flux to the divertor plate by one order.

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