1st Asia-Pacific Conference on Plasma Physics, 18-22, 09.2017, Chengdu, China

ELM mitigation with n = 1 perturbation fields on the HL-2A tokamak

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ELM mitigation by applying n = 1 resonant magnetic perturbation was first obtained in recent HL-2A experiments. The in-vessel coil system is constructed of four small aperture coils, poloidally 2 and toroidally 2. ELM mitigation was investigated in moderate pedestal collisionality ($\nu^*_{e,ped} \sim 1$) H-mode plasmas. The ELM frequency increased by a factor of 2 and the amplitude of the D_α signal decreased. During ELM mitigation with the n = 1 field, the simultaneous density pump-out effect always was observed.

With varying plasma current I_p of 130-180 kA and toroidal magnetic field B_t of 1.2-1.4 T, ELM mitigation is sensitive to the edge safety factor q_{95}, as shown in figure 1. ELM mitigation window of q_{95} = 3.65-3.85. The drop of core toroidal velocity measured by charge exchange recombination spectroscopy was always observed in ELM mitigation discharges correlated with density pump-out.

Modelling efforts have been devoted to understand and to interpret ELM control in HL-2A. The edge safety factor window for ELM mitigation in the experiments is explained in terms of the edge-peeling response, which often manifests itself as pronounced plasma displacement near the X-point.

[1] Liu Y.Q. et al 2016 Plasma Phys. Control. Fusion 58 114005