

大型ヘリカル装置における外部摂動磁場による高速イオン損失  
**Fast-Ion Loss due to Externally Applied Magnetic Perturbation  
 in Large Helical Device**

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One of the issues in the fusion device is controlling/reducing a heat load to a first wall or a divertor to the acceptable level. In ITER and DEMO, it has been predicted that strong edge localized modes (ELMs) can cause ablation of divertor [1]. Reduction of divertor heat load due to ELMs has been demonstrated by application of externally applied magnetic perturbations (MPs) in tokamaks and helical/stellarator [2, 3]. Such MPs may increase a local heat load of fast ion to the first wall because they induce stochastic orbit loss of fast ion. Recently, to study the effect of externally applied MPs on fast ion losses, a scintillator-based lost fast ion probe (SLIP) [4, 5] is used in large helical device (LHD). A SLIP works as a magnetic spectrometer providing the energy and pitch angle of lost-fast ion, simultaneously. Experiments are performed in the magnetic configuration with toroidal magnetic field strength ( $Bt$ ) of 0.9 T (direction of toroidal field is counterclockwise from the top) and the preset magnetic axis position ( $R_{ax}$ ) of 3.60 m. Note that there is no significant difference of the temperature and density of plasmas in these discharges with/without MPs. We found that MP induces increase of lost-fast ion signal in wide energy and pitch angle ranges. With MP, fast-ion loss rate to the SLIP having energy/pitch angle of 70~180 keV/55~70

degrees increases by a factor of two (Fig. 1) whereas fast-ion loss rate to the SLIP having energy/pitch angle range of 70~180 keV/20~40 degrees increases by a factor of 1.5 with MP. In this experiment, radial field strength of MP on the magnetic axis position is about  $10^{-3}$  T. In this paper, fast-ion loss due to MPs in detail will be presented.

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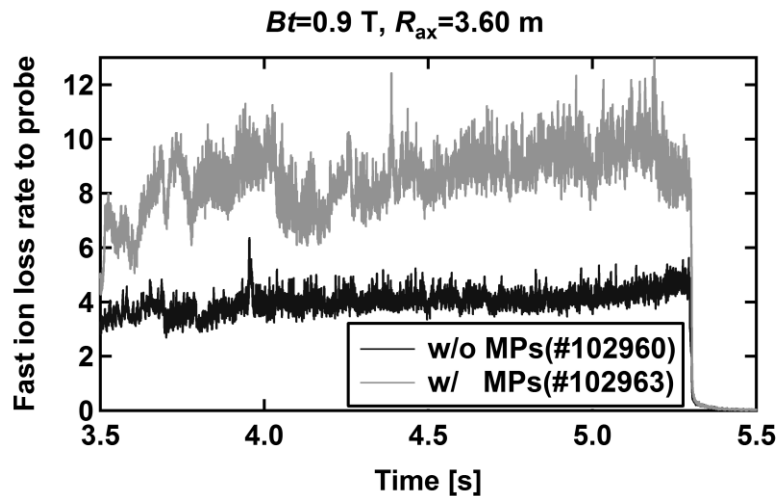


Fig. 1 Fast-ion loss rate is measured by SLIP at experiments without and with MPs. The fast-ion loss rate becomes about double due to MPs. The energy and pitch angle of fast ions are 70~180 keV and 55~70 degrees, respectively.