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EX/3-3: ELM Control in Application of Non-Axisymmetric Magnetic Perturbations in KSTAR

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In 2011 KSTAR campaign, we successfully demonstrated an ELM suppression by applying small non-axisymmetric magnetic perturbations, which is the first achievement by using $n=1$ magnetic perturbations (MPs) [1] while DIII-D did by using $n=3$ MPs [2]. The ELM-suppressed MP discharges show several unique features such as two step ELM responses (intensification and then suppression) and a gradual increase of density in the ELM-suppressed phase. Also, there were several interesting phenomena caused by the applied MPs found; (1) A saturation of Te pedestal evolution suggesting an enhanced electron thermal transport in the pedestal, (2) an abrupt change of floating potential on divertor plate depending on the applied magnetic spectra suggesting a distinctive change of pedestal particle transport, and (3) a characteristic broadband change of magnetic fluctuations depending on the magnetic spectra showing a correlation with the edge Te evolution. Also it was validated that the ELMs can be intensified (increased size and reduced frequency) by applying a particular $n=1$ MP, which is another important ELM response for further understanding of ELM-MP physics mechanism. Furthermore a variety of ELM responses to different magnetic spectra has been observed such as a strong mitigation and a direct H/L back-transition by $n=1$ MPs, and even a triggering by $n=2$ MP. It reveals out the importance of understanding the underlying ELM-RMP physics mechanism and of optimizing the magnetic spectra on ELM control.

[1] Y.M. Jeon, et al., submitted to Phys. Rev. Lett. (2011)

[2] T.E. Evans, et al., Phys. Rev. Lett. 92, 235003 (2004)

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