§9. Localization of Radiative Structure with a Magnetic Island in LHD Plasmas

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Understanding the structure of plasma radiation is important since the localized deposition of heat on the chamber wall constrains the performance of a fusion reactor. In the last year we have upgraded an imaging bolometer on LHD [1] and have observed the radiation pattern from a tangential port. LHD has the unique capability to produce an m=1/n=1 magnetic island. The addition of the magnetic island has been seen to enhance detachment and change the radiation pattern measured by one dimensional diagnostics [2]. In this report the change in the radiation pattern observed by an imaging bolometer with and without a magnetic island is compared to the results of the EMC3-Eirene model [3].

In Figure 1 the results of carbon edge radiation from the model are integrated into the field of view of the imaging bolometer. The pattern which is observed is due to the strong radiation from the helical divertor x-points. One notes that with addition of the magnetic island the radiation pattern is more focused. In Figure 2 the corresponding images from the IRVB are shown. These also shows a similar radiation pattern which becomes more focused with the addition of the magnetic island. This might possibly be due to the change in the magnetic structure due to the introduction of the magnetic island, which breaks up the magnetic surfaces around the helical divertor x-points and forces the radiation to be more localized near the helical divertor x-points. Further work will look at the change in the radiation pattern as the plasma detaches with the magnetic island at higher density and the comparison with the non-island case.

Acknowledgement

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[1] B. J. Peterson et al., accepted for publication in Plasma Fusion Res.
[2] M. Kobayashi et al., Phys. Plasmas. **17** 056111 (2010).
[3] Y. Feng et al., Contr. To Plasma Physics **44** 57 (2004).

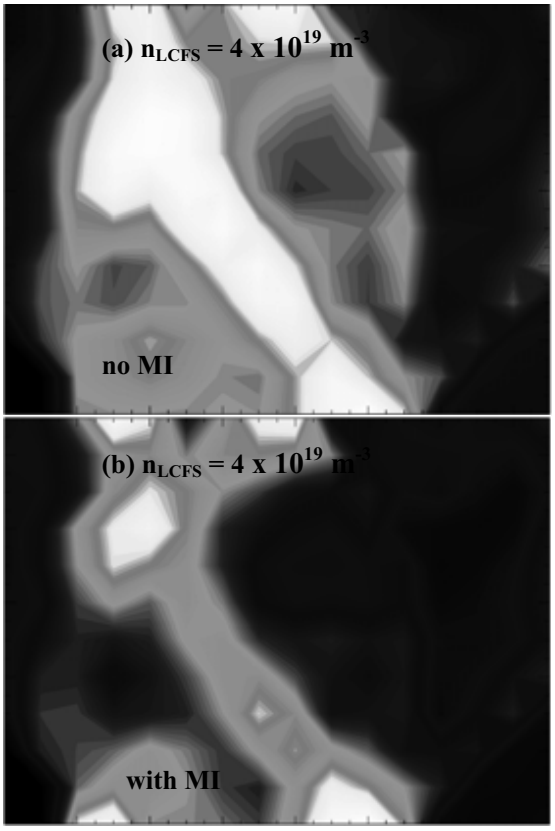

Fig. 1 Model results line-integrated into IRVB field of view (a) without and (b) with MI.

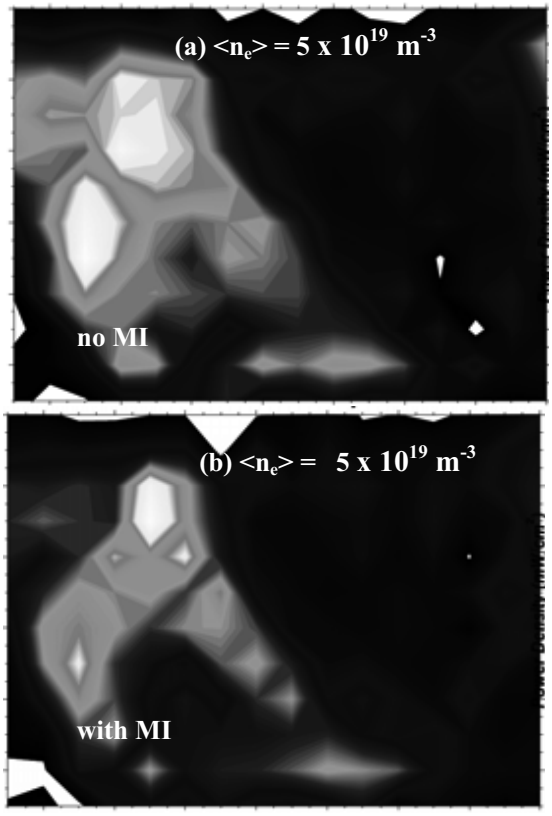

Fig. 2 IRVB data showing radiation from plasmas attached (a) without and (b) with MI.