

## § 42. Comparison of Radiation Characteristics of Wall Limiter and Helical Divertor Discharges

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In LHD discharges the plasma facing components are normally the graphite helical divertor tiles, however experiments have also been carried out scraping off the plasma on the stainless steel inboard vacuum vessel wall by changing the shape of the magnetic surfaces through coil current modification. By comparing the radiation profiles from the bolometer diagnostic [1] for these two cases as seen in Fig. 1 the advantage of the graphite helical divertor can be seen in the reduced core radiation. The source of this core radiation is indicated in the emission spectra from a VUV spectrometer seen in Fig. 2, which shows reduced iron impurities in the case of the graphite helical divertor. In addition, as seen

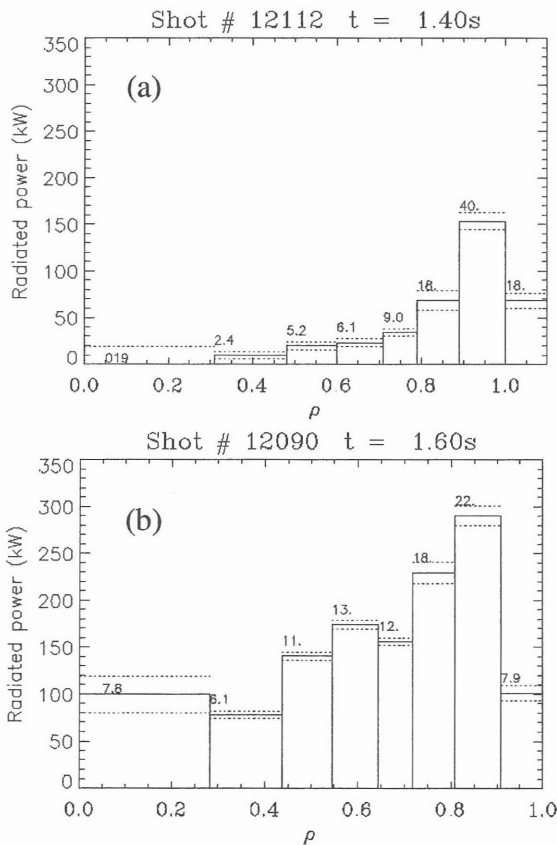


Fig. 1. Radiated power profiles for (a) graphite helical divertor case and (b) SS wall limiter case ( $n_e = 2 \times 10^{19}/m^3$ ).

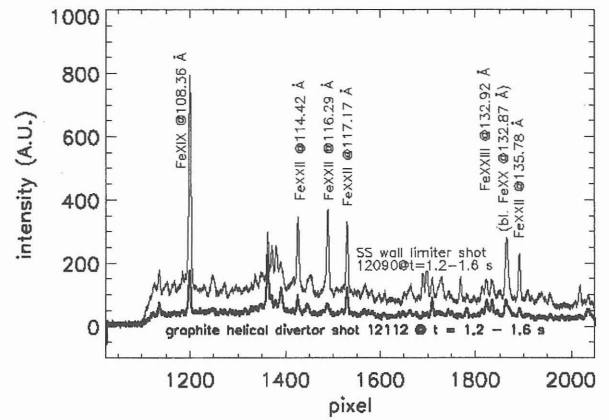


Fig. 2 Emission spectrum from VUV spectrometer for SS wall limiter case (thin line) and graphite helical divertor case (thick line) at the times corresponding to those of Fig. 1.

in Fig. 3, using the wall limiter, an oscillation occurs which has a frequency dependence on density which is similar to that of the 'Breathing' phenomenon [2] in the low density regime, but different in the high density regime indicating a difference in the density dependence of the impurity transport of the ergodic edge layer, which is scraped off in the case of the wall limiter [3].

### References

- [1] Peterson, B.J. et al., *Plasm Phys. Contr. Fusion* **45** (2003) 1167.
- [2] Peterson, B.J. et al., *Nucl. Fusion* **41** (2001) 519.
- [3] Peterson, B.J. et al., *J. Nucl. Mater.* **313-316** (2003) 1178.

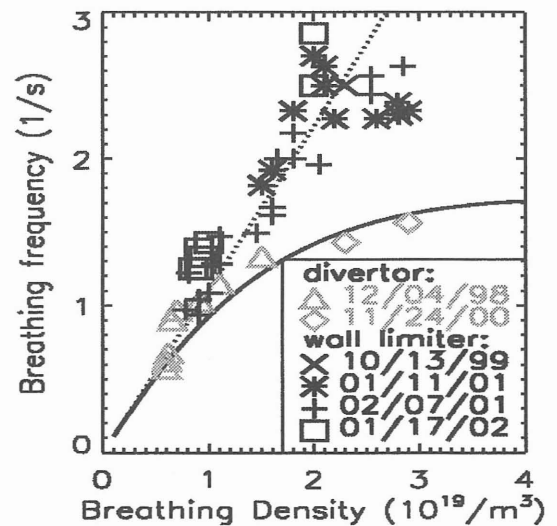


Fig. 3. Density dependence of frequency for oscillations with SS wall limiter and SS helical divertor. Dashed line is given by Eq. 1 and solid line is given by Eq. 2.