

LHD定常放電時のダイナミックリテンションに関する研究

Dynamic retention in LHD long discharges

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Investigations of wall recyclings and dynamic retentions are important for steady state plasma operations in fusion devices. In the Large Helical Device (LHD) mainly helium working gases are used the steady state operation heated by ion cyclotron resonance frequency (ICRF). The penning gauge spectroscopy is one of the useful diagnostics for the partial pressure of neutral gases under strong magnetic fields [1]. Figure 1 shows an example of the spectra from the penning discharge and H α and He I lines of 668.7 and 706.5 nm are observed. For the helium partial pressure measurement, the intensity of He I line at 667.8 nm is used. The time resolution is usually 200 ms for high density plasmas and 1s for steady state plasma discharges more than 10 minutes.

For steady state operations, the penning gauge measured during 2.3 hours as shown in Fig.2 and characterizations of neutral helium pressures at both before and after plasmas were observed.

Figure 3 shows a comparison between hydrogen and helium intensities before plasma discharges measured by the penning gauge. A pulse length at LHD shot, #117207, was a few seconds and aftereffects of wall recyclings by neutral helium gases are negligible. But after LHD shot #117208, which plasma pulse length is about 18 minutes, high wall recyclings by neutral helium gases are remained until just before the next LHD shot, #117209. The high recycling phenomenon is one of reasons for plasma terminations of steady state plasmas in LHD.

[1] H.Funaba et al., EPS conference (2012).

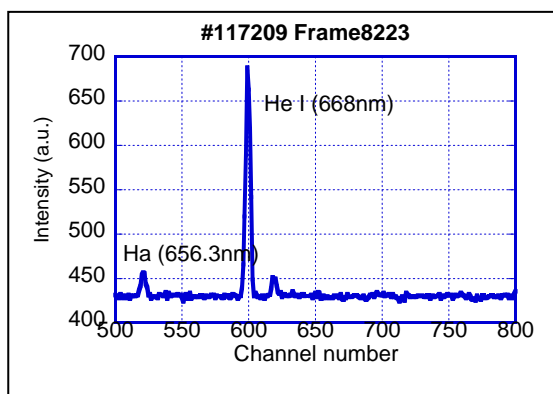


Fig.1 An example of the visible spectrum from the penning gauge.

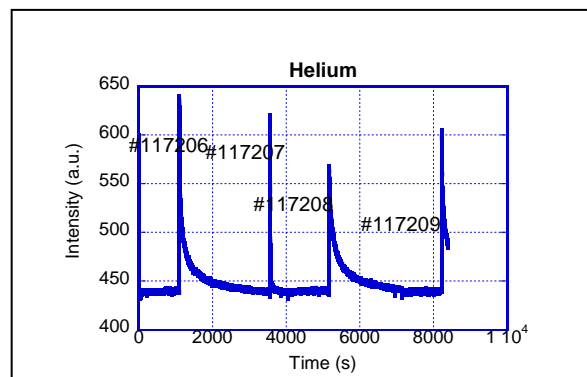


Fig.2 Time evolution of integrated intensities from He I line by the penning gauge. (LHD shot from #117206 to #117209)

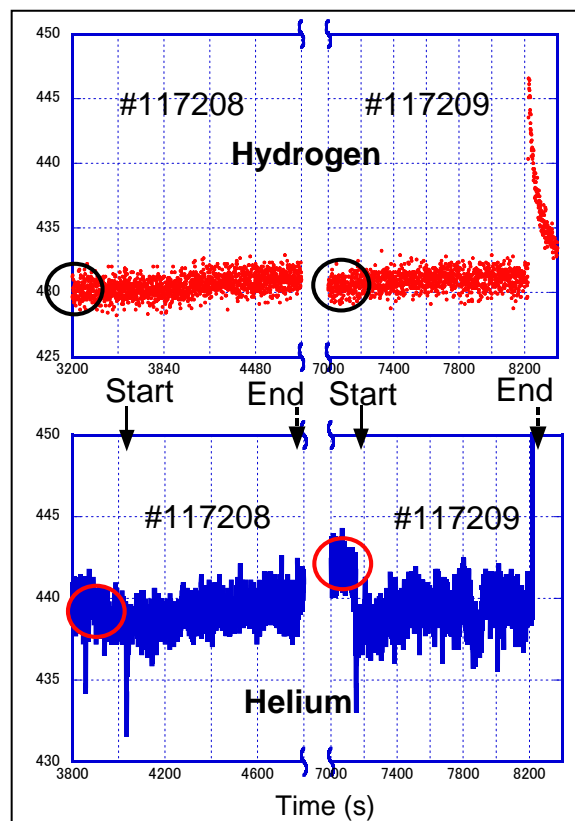


Fig.3 Comparison between hydrogen and helium intensities before plasma discharges measured by the penning gauge.