§1. Neutral Beam-Heated Helium Plasmas in Poloidal Divertor Configuration

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In this fiscal year a cryosorption pump with high pumping speed for hydrogen is installed to operate NBI system easily without liquid helium and nitrogen[1]. The heating power is increased up to 400 kW with 100 ms pulse duration, after aging operation for about 4 months long. Because of neutral beam injected nearly perpendicular into the plasma, line averaged electron density of the target plasma should be raised more than 4×10^{13} cm^{-3} to minimize shine-through of the beams. Moreover, low plasma current (< 150 kA) is required to well-define the plasma boundary by magnetic separatrix. In the present wall condition of JIPP T-IIU, it is fairly difficult to produce high density and low current deuterium or hydrogen plasmas, since plasma disruption often occurs. We have found high density helium plasmas are relatively easily obtained with strong helium puffing. We have carried out NBI heating in relatively high density helium plasma (~ 4×10^{13} cm^{-3}). Figure 1 shows time evolution of plasma parameters in NBI heated helium plasma in divertor configuration, where toroidal magnetic Bt~2.9 T, plasma current Ip~150 kA, absorbed NBI power ~360 kW. Note that in this discharge the null points of the divertor are just on the divertor target plates. During NBI heating electron density further increases due to enhanced particle recycling. Nevertheless, electron temperature is increased clearly even in very high density, exhibiting obvious reduction of ohmic heating power(200 kW to 160 kW). The global energy confinement time is about 18 ms during NBI. We are now optimizing NBI heated plasmas with lower plasma current in poloidal divertor configuration.

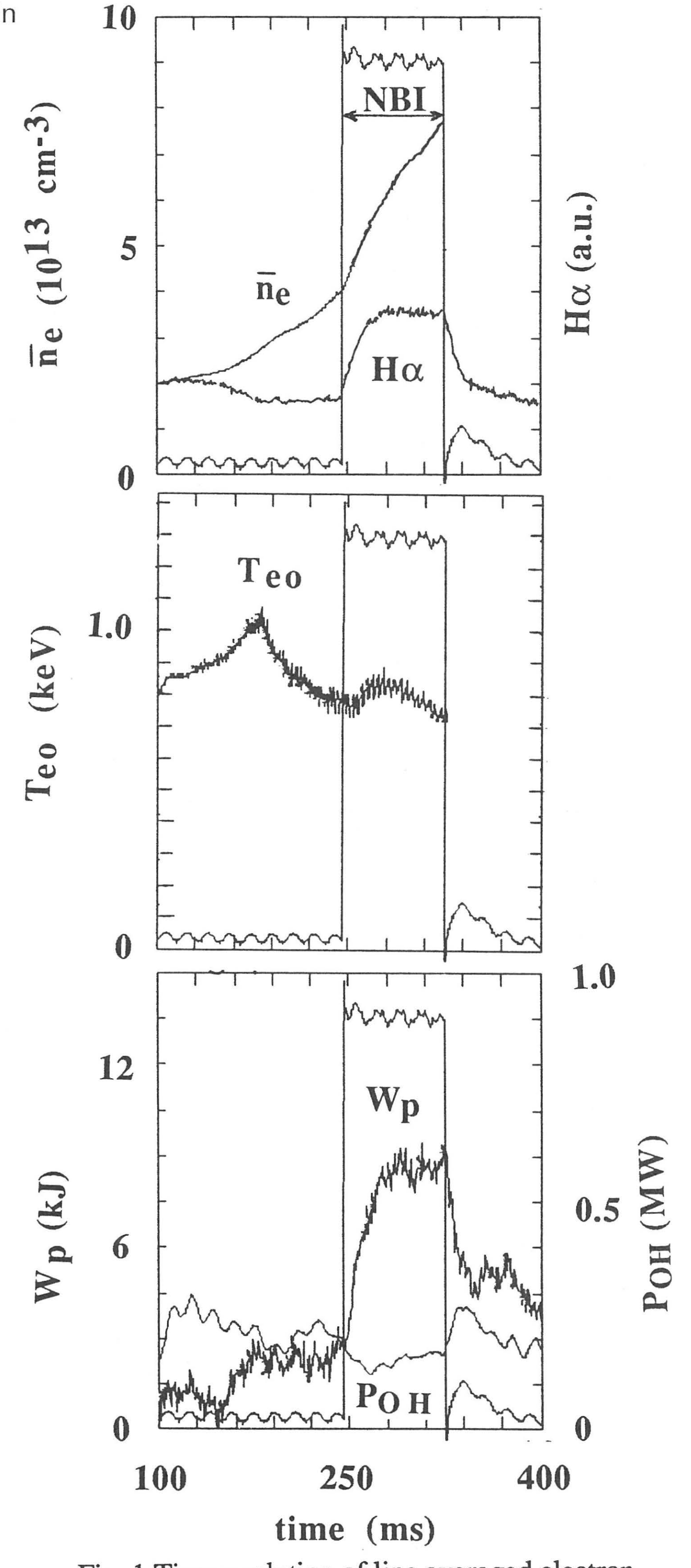

Fig. 1 Time evolution of line averaged electron density, Hα-emission, central electron temperature, plasma stored energy and ohmic heating power in NBI heated high density helium plasma.

Reference
1) Oka, Y. et al, this issue.