## §6. ICRF Heating Plasma Qualities for Various Boronized Wall Conditions

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We describe how different plasma qualities were for two different boronized vacuum wall conditions in this section. We tried two boronization schemes; referred to boronization with small flow rate and with large flow rate. In the boronization with small flow rate, boron gas was fed into He glow discharge(1Ax200V with one electrode) at 30 to 40mtorr using 150l/sec vacuum pump(effective pumping speed is estimated about 10l/sec). Unfortunately we did not measure boron gas flow rate, however, the oven temperature of vaporized boron could tell us its pressure. The operating oven temperature ranged 70°C, where the boron vapor pressure was 4.5torr. On the other hand, 1500l/sec vacuum pump was used at effective pumping speed, about 700l/sec in the boronization with large flow rate. The pressure in He glow discharge was 6 to 20mtorr. The He gas flow was much larger so that He glow discharge power was tripled by adding 2 new electrodes. The operating oven temperature was 70°C same as in the boronization with small flow rate.

In Fig.1, various plasma parameters were compared such as stored energy, radiated power and ratio of average electron density to plasma production rate deduced from $H_\alpha/D_\alpha$ measurement, indicating relative particle confinement time from top to bottom. Solid and dashed lines showed the boronization with small flow rate and with large flow rare, respectively. In these experiments, gas puffing rate, injected RF power and average electron density were same, ranging in 20-17torrl/sec, 500-600kW and 1-4.5x$10^{13}$cm$^{-3}$, respectively. The particle confinement time was also same during whole ICRF heating period as shown in Fig.1, where $H_\alpha/D_\alpha$ intensities were measured at 8 different toroidal sections. The obtained stored plasma energies, however, were different; the stored energy in solid line reached to 2kJ and lasted at the end of RF pulse. On the other hand, the stored plasma energy started to decrease with increase in the radiated power at the middle of RF pulse and disappear at the end of RF pulse with radiated power of 300kW in dashed line. We could not find any other differences except for toroidal distributions of $H_\alpha/D_\alpha$. Figure 2 shows its toroidal distribution at 80ms. The deuterium gas was fed at No.2 port and 5 antenna were sited at 1, 3, 5, 7 for P-port antenna and at 8 for U-port antenna. The toroidal uniformity of $H_\alpha/D_\alpha$ in solid line was much better than in dashed line, which tendency was observed during whole ICRF heating pulse. This experimental result suggests that uniform gas puffing will provide a successful future ICRF heating on LHD.

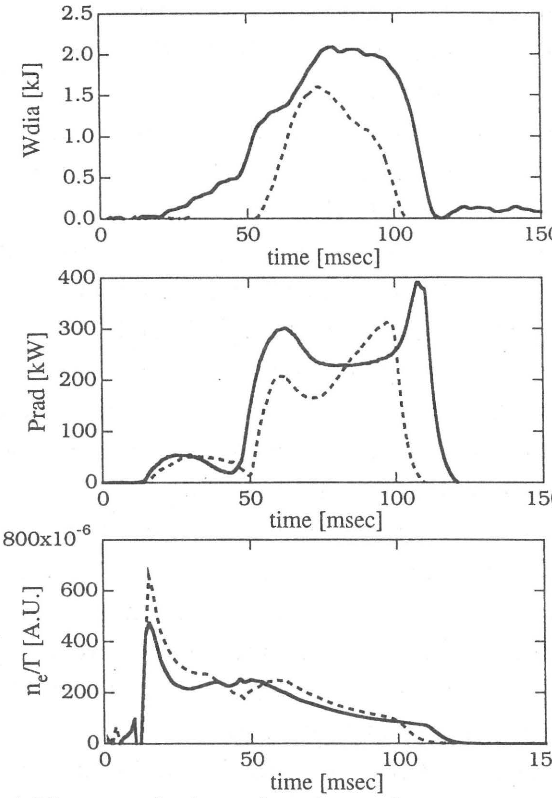


Fig.1 Time evolution of various plasma parameters in boronization with small gas flow rate (solid lines) and with large gas flow rate(dashed lines).

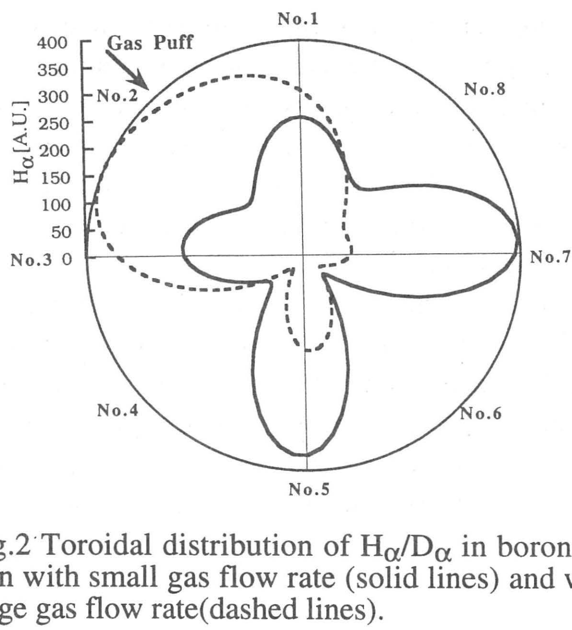


Fig.2 Toroidal distribution of $H_\alpha/D_\alpha$ in boronization with small gas flow rate (solid lines) and with large gas flow rate(dashed lines).