

### §3. Neutral Beam Injection System of CHS

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Following NB injector #1(NBI#1), NB injector #2(NBI #2) also has started operation since April 2000, and has injected beam constantly to CHS since last September. The specifications of NB#2 are as follows,

#### Ion source

beam energy	30kV (50kV in future)
H+ current	60A
pulse width	1s at repetition of 300s
beam extraction area	300mm $\phi$
filament	1.6 $\phi$ (8set)
gas pressure	0.3Pa
magnetic field	0.2T at the surface
accelerator	single stage, three grids
electrode	Mo

#### Beam line

vacuum chamber	1.5m <sup>w</sup> X1.7m <sup>d</sup> X1.6m <sup>h</sup>
Gas neutralizer	0.7m
ion separation	magnetic deflection
beam dump	durable for 50kV 1s beam
calorimeter	durable for 0.2sec full power beam

#### Power supplies

filament	12V 1600A 10s/300s
arc	130V 1300A 1s/300s
extraction	-3.5kV 6.5A 0.2s/300s
acceleration	40kV 60A 0.2s/300s

All the power supplies and beam lines are electrically isolated from the floor in order to decrease the current flow to the other diagnostics or heating system when the dielectric breakdown occurs in the ion sources. Withstanding voltage of plasma electrode with 40kV at 1s is confirmed.

Three electrodes of NBI#2 are all made of Mo with Mo cooling pipe outside, while the accelerator of NBI#1 is composed of Mo plasma electrode and copper electrodes. The electrodes of NBI#1 have several kinds of cooling system. In this campaign, plasma electrodes with Mo cooling pipe of both NB injectors had cooling water leakage problems.

Both NB injectors could inject the maximum power of 1MW as their designed value. NBI#1 reached to 40kV, 48A, and NBI#2 to 30kV 60A at the pulse end. Longest pulse widths injected to CHS were 200ms. Both injectors are installed in the co-injection, and only one injector can heat plasma enough. The power of NBI#2, however, is suppressed at the beginning of injection, because NB#2 has no pre-arcing in its operation system. In order to get a constant beam power, the time sequence controller is replaced in the near future. NB injectors are triggered at the same timing, and inject beams to CHS simultaneously.

The beam modulation mode of both NB injectors has also been prepared. At present 20ms repetition is available as is shown in fig.1.

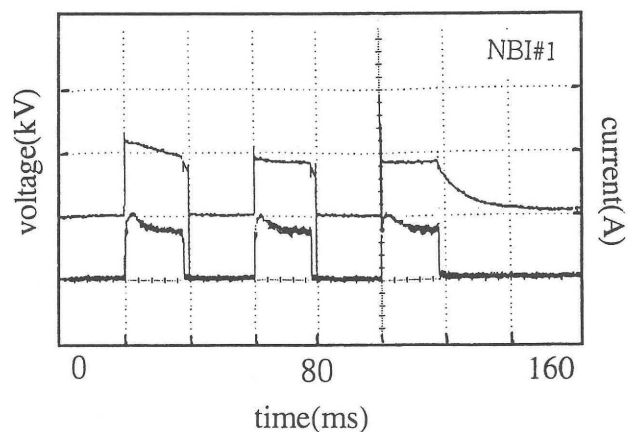


Fig.1 Typical operation of beam modulation mode of NBIs. Repetition time is 20ms, upper line and lower line show the acceleration voltage and the acceleration current, respectively.