

§14. New Neutral Beam Injection System of CHS

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Neutral Beam Injection system of CHS was moved into Toki site following CHS torus, and renewed.

Originally CHS had two NB injectors (NBI #1 and NBI #2), whose powers are 1 MW each with 40 kV, and both were settled as one for co-injection and the other for counter. Now we rearranged both injectors to be co-injection(Fig.1), and newly constructed the ion source and beam line of NBI #2 with 1 MW at 30 kV. The energy of NBI #2 can be increased up to 50 kV and injection can be modulated with the frequency up to 100 Hz. These rearrangements enable us to investigate the phenomena with high beam fuelling, high beam deposition power, and enhanced toroidal rotation, and to do NB power modulation experiment.

The positive ion source and beam lines of NBI #1, both NBI operation systems, and all power supplies of both NB injectors were cleaned for the first time after more than 10 year usage and then retuned carefully. In especial, the characteristics of the power supplies for NBI #2 were examined to prepare for new 50 kV operation. The positive ion source and beam line of NBI #2 were newly designed to satisfy the required power. The material of electrodes is changed from copper into molybdenum. The water cooling system is added on the surface of electrodes. In addition, under the ideas of compactness and maintenance-ease, configuration of the ion source and the beam line was decided. The former concept is required in order to keep the flexibility of injection angle, not only

for the toroidal angle but also for the poloidal angle(Fig.2), in the case of future satellite machines with different plasma characteristics and complicated shape of magnetic coils, like CHS-qa. For the latter purpose, double number of filaments are prepared in reserve and mounted symmetrically. The ion source is constructed to be convenient for replacement of filaments. We also replaced the liquid helium tanks and liquid nitrogen panels of injectors with cryopanel, which made the system maintenance much easier.

The resettlement of NBI #1 was finished in December 1999. The rearrangements of all equipments at the different circumstances of torus hall changed the total characteristics of NBI, even for NBI #1. On the other hand, the operation systems of injectors were not improved, which made the operation rather difficult. NBI #2 will be operated without pre-arc. We have started the conditioning of NBI #1 and injected beam into CHS plasma from the machine cycle of February 2000. Although it is still under conditioning, at this stage we could get the calculated power of 650 kW. Construction of NBI #2 was just finished in the spring of 2000. We are now examining whole system of NBI #2, and the operation of aging will start soon.

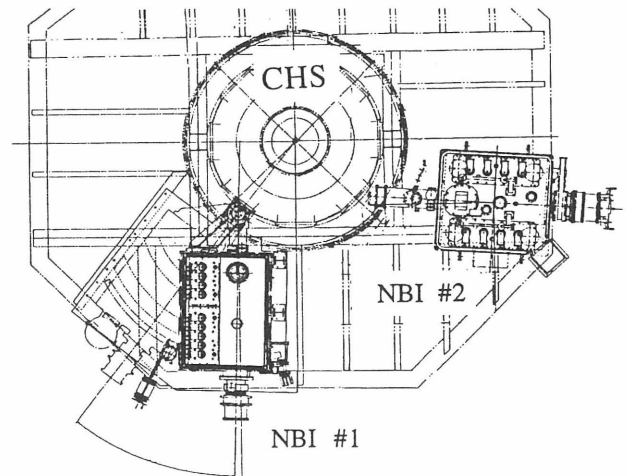


Fig.1 The schematic view of NB injectors of CHS.

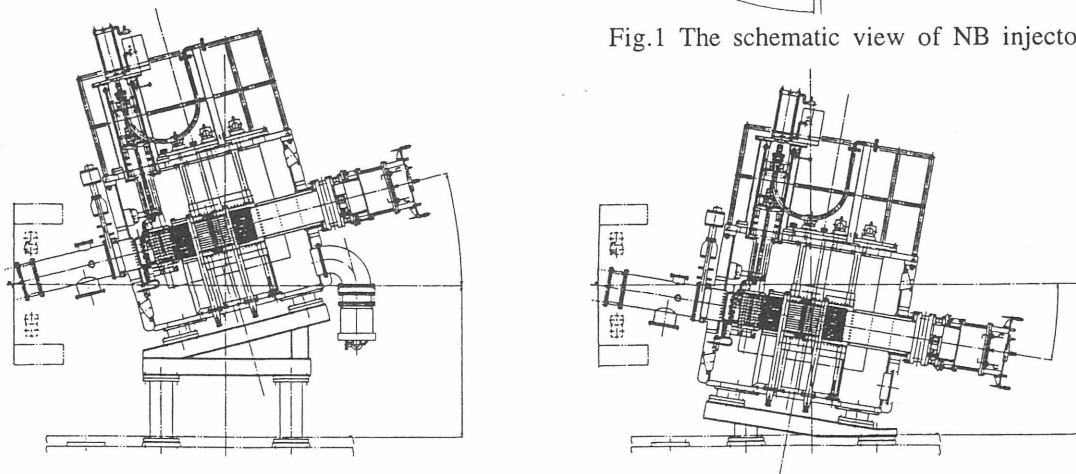


Fig.2 Flexibility in injection angle of NBI #2 for a satellite machine.