

§17. Development of a High Pumping Speed Cryosorption Pump for Neutral Beam Injector in JIPP T-IIU Tokamak

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A new cryopump of 300m<sup>3</sup>/s has been developed for a neutral beam injector (NBI) with an electrical output of about 2MW in the JIPP T-IIU Tokamak. As the major requirement for this design was to meet the specification of the pump (Table I) and to make a maintenance simple and running-cost cheap, the pump design has been decided to apply a large area of a charcoal sorbent wall without both liquid helium and liquid nitrogen (i.e., maintenance-free), which were necessitated for the cryo-condensation pump in old JIPP T-IIU-NBI system.

The cryo-sorption pump consists of (Fig. 1) the body of the pump (nominal diameter 1500mm by 1900mm deep), internal structure of two stage (generally called the 20K stage, and the 80K stage) and seven cryogenerators. The pump was installed at the top of the injector vacuum vessel. It was found that the measured pumping speed of 330m<sup>3</sup>/s for hydrogen was very close to the design value of 300m<sup>3</sup>/s (Fig. 2). At the bottom of the beam line pumping speed was limited to about half due to a restricted conductance of the beam line components.

This pump has been successfully operated in about a year without any trouble. The maintenance and the operation has been simplified dramatically. The operation of high pumping speed cryo-sorption pump on the JIPP T-IIU-NBI has been accumulated for the application of the pump in the LHD-NBI system.

Table I. Specification of 300 m<sup>3</sup>/s Cryo-sorption Pump for Hydrogen

Pumping speed	300 m <sup>3</sup> /s
Ultimate pressure	< 10 <sup>-7</sup> Torr
Pumping capacities	>660 stdl
Size	1500 diam x 1900
Gas flow	30 TI/s for 1.5 s
Ion source	Beam current of 50 A Beam energy of 40 keV
Utilities	Without Liq.He and Liq.N <sub>2</sub>

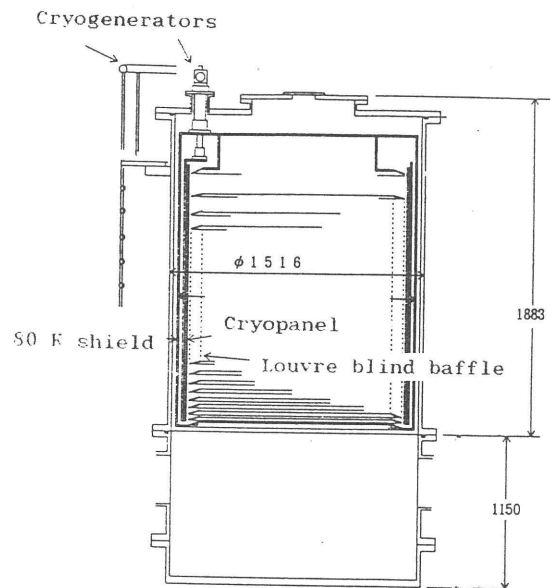


Fig. 1. Schematic diagram of a new cryo-sorption pump for JIPP T-IIU-NBI. Nominal pumping speed is 300m<sup>3</sup>/s.

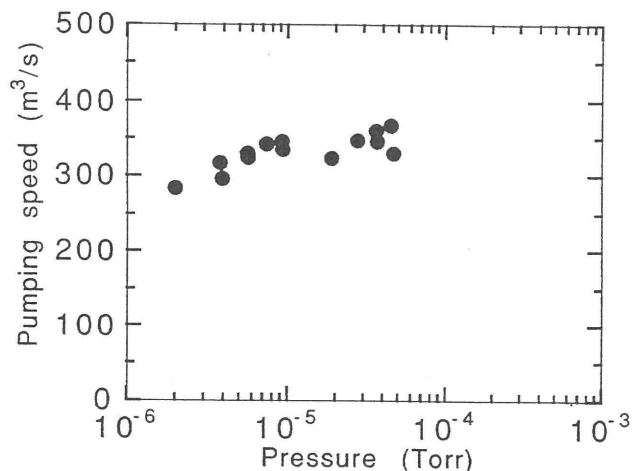


Fig. 2. Pumping speed for hydrogen vs the gas pressure.