Measurement of HL-2A NBI Beam Profile and Beam Power∗

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Abstract To optimize the operation parameters of the beam line of NBI on HL-2A, features of
the beam line, including the beam profile and the power deposited on components and injected into
the tokamak plasma, were measured. The operational parameters of the four sources on the beam
line were optimized with the monitor of the beam profile and beam power, and the transmission
efficiency of the NBI injected power was therefore increased. A beam diagnostic system for the
beam line of the NBI system on HL-2A as well as the diagnosed results was also presented.

Keywords: neutral beam, injected power, beam profile

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1 Introduction

Energetic neutral beam injection (NBI) is an effective
method to heat the plasma in fusion devices [1,2]. High
power NBI systems were built up in large tokamaks and
stellarators. As a sub-system of the neutral beam injec-
tor, a measurement system for the beam line was estab-
lished on HL-2A, which was mainly used to monitor the
energy deposition on each water-cooled component [3]
and acquire the thermocouple signal in the adiabatic
calorimeter. Utilizing primary experimental data such
as the temperature difference of the thermocouples, the
flow rate and the temperature difference of the cooling
water, the beam profile and beam power [4] can be
obtained. It is possible to increase the efficiency of
the neutral beam power injected into the plasma of
HL-2A by adjusting the operational parameters of the
ion sources related to their beam profile and beam
power. In section 2, the basic principle and the main
composition of the neutral beam line for HL-2A are
presented. In section 3, some measured results and rel-
levant analysis are provided.

2 Experimental setup and
measurement method

A schematic of the HL-2A neutral beam injector is
shown in Fig. 1[5]. Four ion sources are installed on the

![Fig. 1 Schematic of the neutral beam injector for HL-2A](image)

1 Vacuum box, 2 Ion source, 3 Neutralizer, 4 Reflecting magnet, 5 Ion dump, 6 Scraper, 7 Actively cooled calorimeters,
8 Titanium pump, 9 Adiabatic calorimeter

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