

# Heavy ion beam probe (HIBP)

M. Nishiura, A. Shimizu

*e-mail: nishiura.masaki@nifs.ac.jp, shimizu.akihiro@nifs.ac.jp*

## 1. Purpose / Application

Measurement of electric potential, its fluctuation, density fluctuation, and their spatial profiles.

## 2. Name of analysis (Kaiseiki) data / module of MyView2

Ask the person in charge.

## 3. General Description (Port, field line, time resolution, spatial resolution, number of channels, etc.)

The LHD-HIBP system is shown in figure 1. The nominal acceleration voltage of the tandem accelerator is 3 MV. The sputter-type negative-ion source produces  $\text{Au}^-$  and  $\text{Cu}^-$  beams ( $< 20 \mu\text{A}$ ).

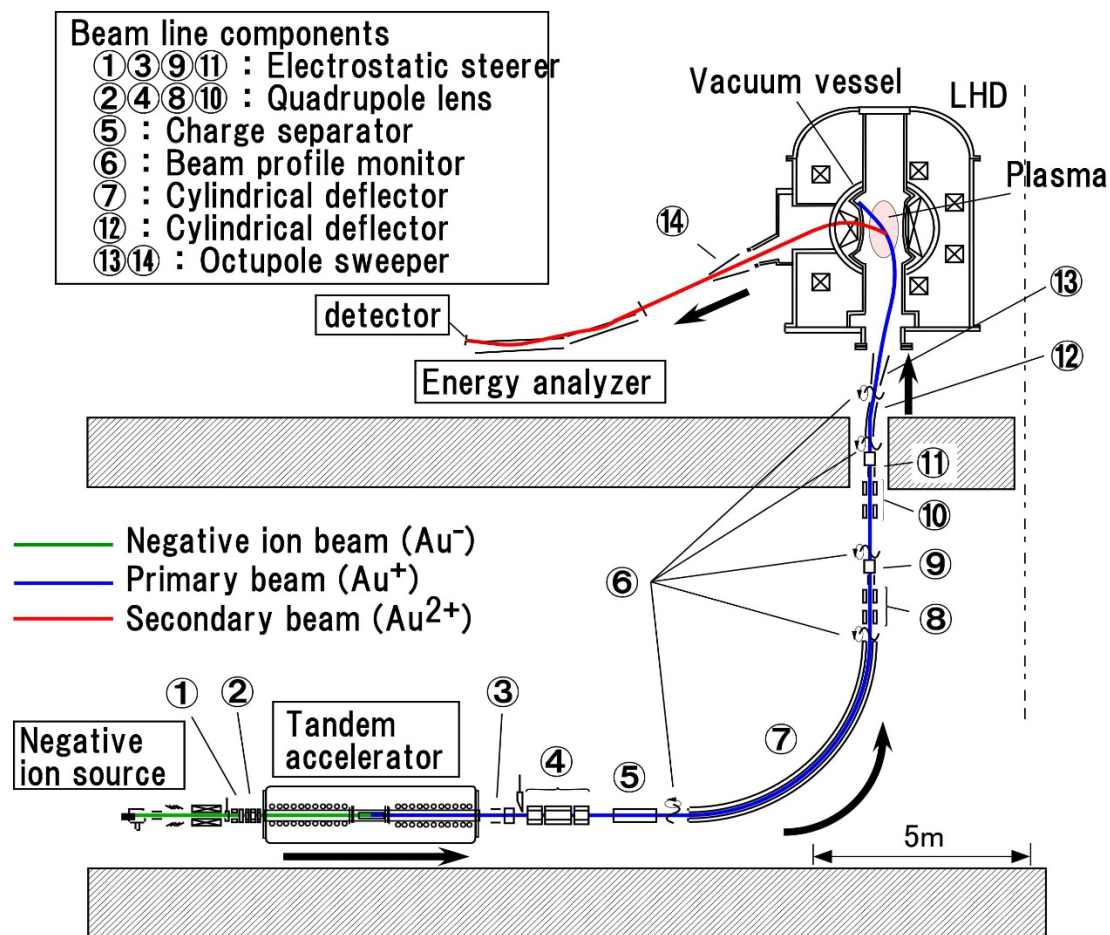


Figure 1 Schematic view of LHD-HIBP. [T. Ido et al., Rev. Sci. Instrum. 77, 10F523(2006).].

3.1 Port: the injection port is 6.5L-AD01 and the detection port is 6O-AD01.

3.2 Time resolution: the digitized data is available up to 200 kHz, which is restricted by signal amplifiers. The spatial profile is measured with 50 ms by scanning the probe beam.

3.3 Spatial resolution: a few cm [T. Ido et al. Plasma and Fusion Res. 2, S1100 (2007).]

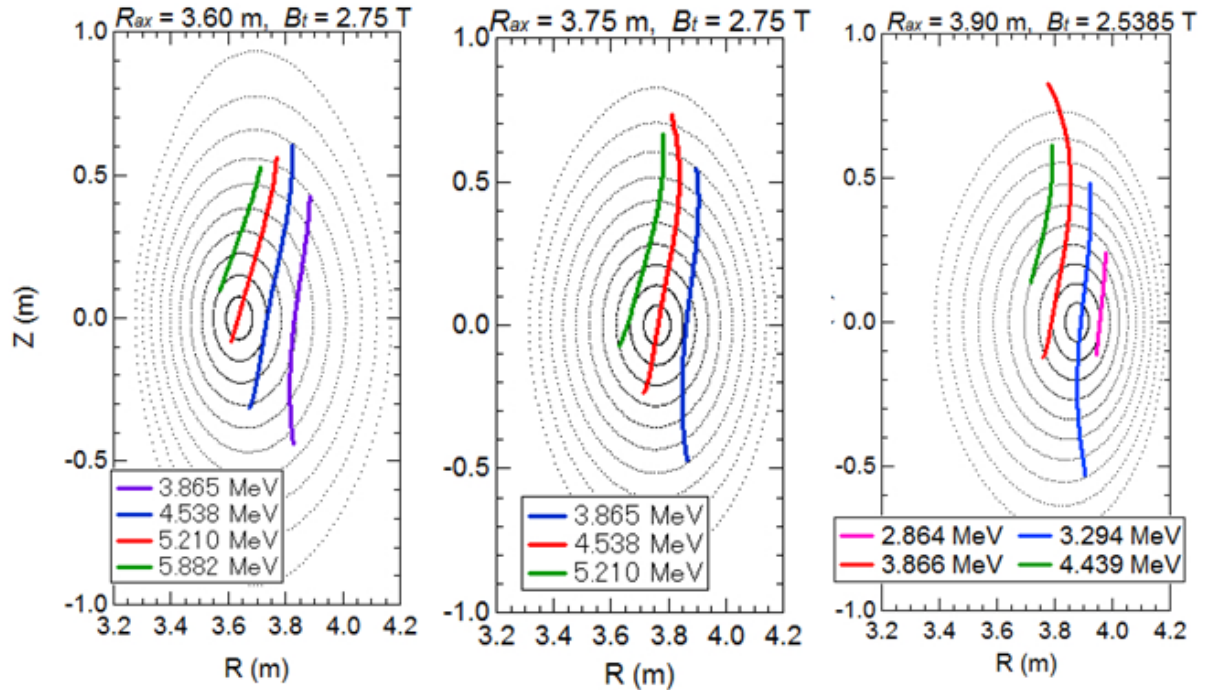


Figure 2 Observable region projected onto a poloidal cross section. Actual observation points are distributed toroidally.

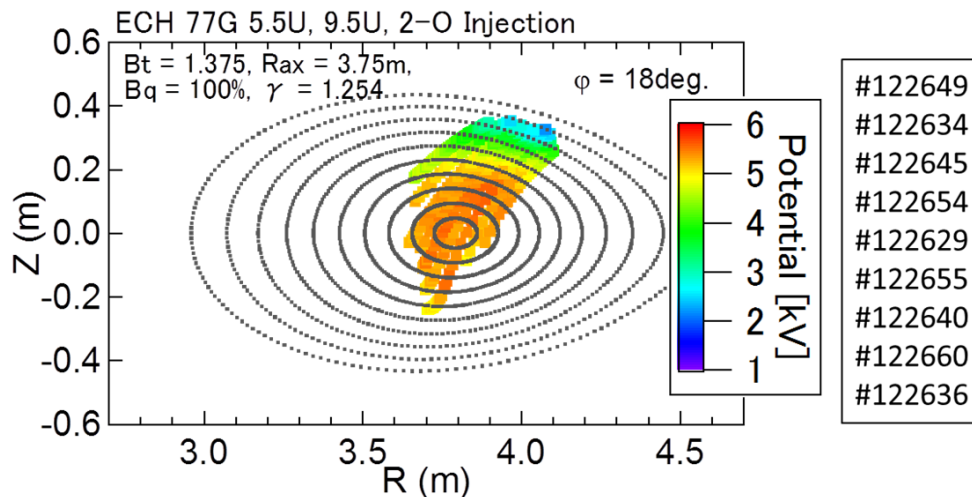


Figure 3 Two-dimensional profile of the electric potential. The measurement positions are projected on a horizontally-elongated poloidal cross section by tracing the magnetic field lines from the actual observation positions. [A. Shimizu, et al., Rev. Sci. Instrum. 85, 11D853 (2014)]

#### 4. Requirement in use

The HIBP diagnostic is possible, when the toroidal magnetic field of the LHD is set to the positive polarity, which is the clockwise direction viewed from the top.

The preferable electron density is  $1.5 \times 10^{19} \text{ m}^{-3}$  or less for the measurement of electric potential profiles, because of the signal to noise ratio. The effort to extend to the higher density is on going.

**5. Description of analysis (Kaiseki) data / module of MyView2**

Ask the person in charge.

**6. Others**

Ask the person in charge.

**References**

[1] T. Ido et al., Rev. Sci. Instrum., 77, 10F523 (2006).

[2] A. Shimizu et al., Plasma Fusion Res., 2, S1098 (2007).

[3] T. Ido, A. Shimizu, M. Nishiura, et al., Fusion Sci. Tech. 58 436-444 (2010).