

§2. Proposed Laser Scanning System in Vacuum Vessel for 2D Thomson Scattering System on LHD

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Development of a two-dimensional Thomson scattering system is important for measuring a profile of a non-circular cross section or local instabilities of plasmas, such as an island structure. A laser scanning system using a translating optical table for 2D Thomson scattering system was developed in ATF [1]. This system is placed at the outside of the vacuum vessel, so that a large vacuum window that the whole scanning beam can be passed through is necessary. In the case of LHD, it is difficult to utilize the large window due to the limitation of a port access. We, therefore, plan to develop the laser scanning system, which is placed in the inside of the vacuum vessel.

The most difficult problem of the scanning system is that the vibration of the optics affects the beam

path. Moreover, faster scan is desirable to obtain higher time resolution. It is necessary to construct the total system compactly, because the system is placed in the vacuum vessel. In order to satisfy these requirements, we plan to utilize a large wheel on a rail that can move at high speed.

Because our main interest is in an edge region and a divertor region of plasma, the scanning system should be able to scan mainly the outer region of the plasma.

Fig. 1 shows a draft of the scanning system. The laser scanning system consists of two parts. One is an outer tube, and the other is an inner tube. The inner tube can move the forward and the backward directions driven by an ultrasonic motors. The large upper and lower wheels can move on the rail that is attached in the outer tube. These two rails suppress the upper and lower vibrations of the inner tube.

Reference

[1] Kindsfather,R.R., Rev. Sci. Instrum. 57(8) pp1826-pp1818 (1986)

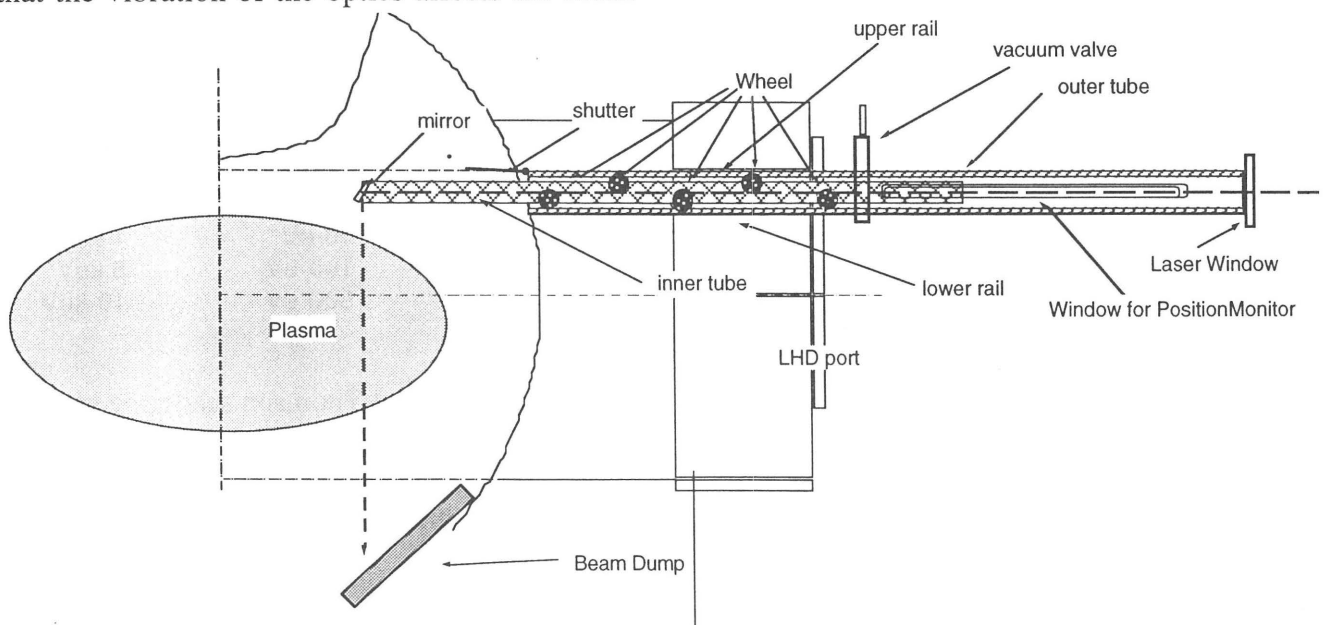


Fig. 1 Schematic diagram of the laser scanning system for the 2 D Thomson scattering system. The laser beam propagates in the center of the inner tube, and injected into the edge region of the plasma by the mirror that is attached at the end of this tube. The window on the side of the outer tube is used for a monitor of the inner tube position to control precisely using a feedback system.