§28. Transport Analysis System for LHD Plasma Using Pellet Injection

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This program will cover two kinds of areas. One is particle fueling for a steady state plasma, particle balance including wall recycling and wall pumping, and temporal changes of their performance. The other is a study of non-local effects of local perturbation given by pellet or gas puffing on the global plasma performance. This program also aims at developing the analysis method for perturbation technique and comparing the results under both high Z material wall condition and low Z covered condition.

< Impurity lines signals in plasmas with energetic electrons>

A 25 optical fiber array equipped with a CCD system (Princeton ICCD-1024) and a visible spectroscopy (Acton AM510) are used to study the global particle balance in steady state operation on TRIAM-1M. Hydrogen Balmer series wavelength spectrum and its vertical profile are usually used to monitor the particle influx into the plasma and is also used to study the effect of the fast energetic electrons on pellet ablation In addition in order to study the impurity behavior oxygen, iron and molybdenum lines are also measured in plasmas with the pure high Z material wall without covering the low Z material. Figure 1shows the H_{α}, OV and MoII vertical profiles.

The low Z ions locates symmetrically in the core region but lower ionized state high Z ions (Mo) show an up-down asymmetry, which is considered to be due to the toroidal drift effect and source effects from the divertor plates made of Mo installed at the bottom of the chamber.

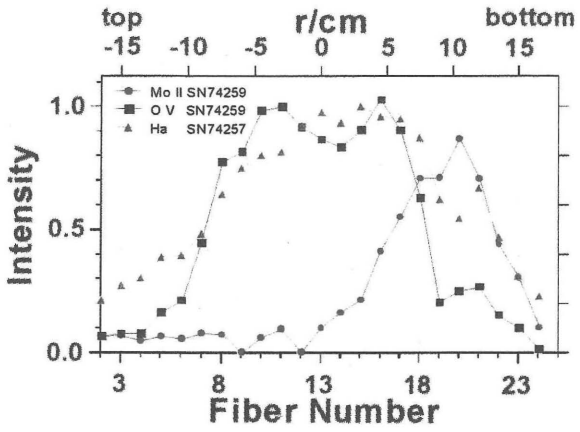

Fig. 1 The intensity profiles of H_{α} , OV, and MoII.

<Curved guide tube for high field side injection>

In the steady state long pulse operation, the fueling efficiency should be improved. The high field side (HFS) pellet injection is one of the most promising fueling methods for fusion plasma, because its fueling efficiency is higher than that of normal low field side (LFS) pellet injection or gas fueling. For this purpose we have tested the transfer efficiency for pellets in the curved transfer tube to optimize the curvature radius in a HFS injection system, which is designed for TRAIM-1M. Three curvature radii 150mm, 450mm and 750mm are tested. The setup and result is shown in Fig.2. A pellet is broken for this case.

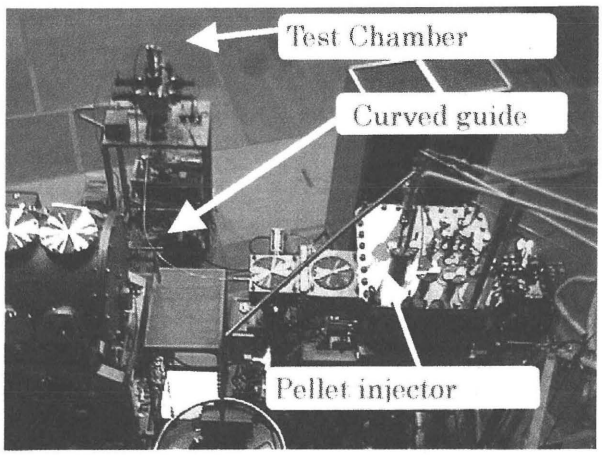

Fig.2 (A) The experimental setup for curved guide tube.

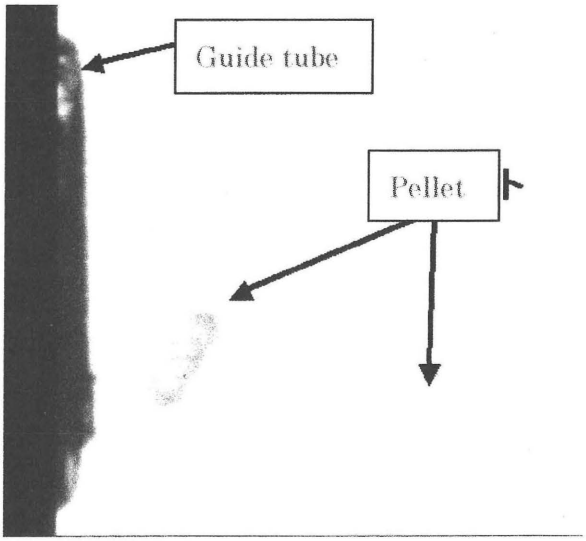

Fig.2 (B) The shadow photograph for ice pellets. The velocity of pellet is about 1km/s.