

## §8. Preliminary Experiment on Cluster Beam

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Pellet fueling is a common technique for fueling to plasma facilities. However, in rather small machines, plasma cannot accept large mass of usual pellets (a few mm length) under the limitation of Grindelwarld limit. Otherwise in the continuous operation of plasma discharges, small amount of continuous fueling that balanced with the pumping of ashes removal is needed. In order to resolve these problems we consider the usage of cluster beam. The physics and technologies of cluster have been investigated in the field of atomic physics and space astronomy for many years. Now we are trying to apply this technique in the fueling or diagnostics for rather small plasma machines. Our technical goal is to obtain a cluster beam with the mass and the velocity controllable.

As a first step, we made a test device that can produce cluster beam. A schematic drawing of experimental set up is shown in Fig.1. It consists of a

cluster source, a vacuum vessel and, pumping systems, and a detector system with difflential pumping system. The cluster source, which is made up of a gas nozzle a collimator and a skimmer, is attached on the flange of the vacuum vessel. We adopted a commercial-used nozzle that is designed and used for a car engine by one generation before. This type of nozzle were also adopted as a gas jet valve in the accelerator experiment. The nozzle is driven by magnetic coil with a rise time of less than 100 msec. A skimmer was added in the downstream side of the nozzle, in order to prevent the cluster beam from collapse by shock wave. Gases are supplied through a small reservoir, in which the pressure is monitored by pressures gauge. We analyze the mass of outgoing beam with a mass analyzer that can measure up to  $M=350$ . In order to control the mass and size of cluster, we prepared several kinds of shapes of nozzle and skimmer with different sizes of holes and mouthpieces.

Experiments has just started in this device. The performance characteristics of the cluster source will be examined by changing operation parameter of the source.

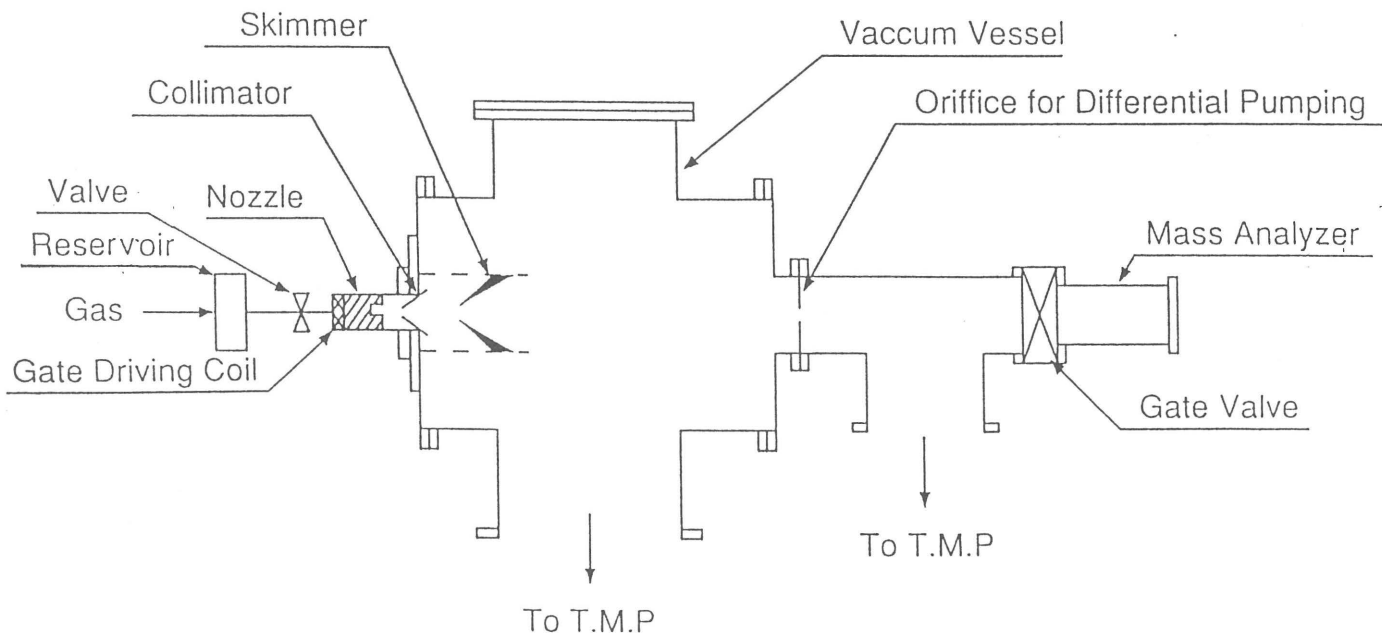


Fig.1. A schematic drawing experimetal set up.