The following twenty-five papers are the second part out of seventy papers, read before the semi-annual meeting of the Institute on December 4th and 5th, 1953.

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1. A Radio Frequency Ion Source

Some Characteristics with Magnetic Field

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(K. Kimura Laboratory)

Tests were made on a 100 M. C., capacitively coupled radiofrequency ion source. The extraction system was almost the same as described by Moak et al. (*Nucleonics*, No. 3, **21**, (1951)), but the canal of the aluminium cathode was 2 mm. in diameter and 13 mm. in length.

The ion beam was collected by a Faraday cage, the diameter of which was 40

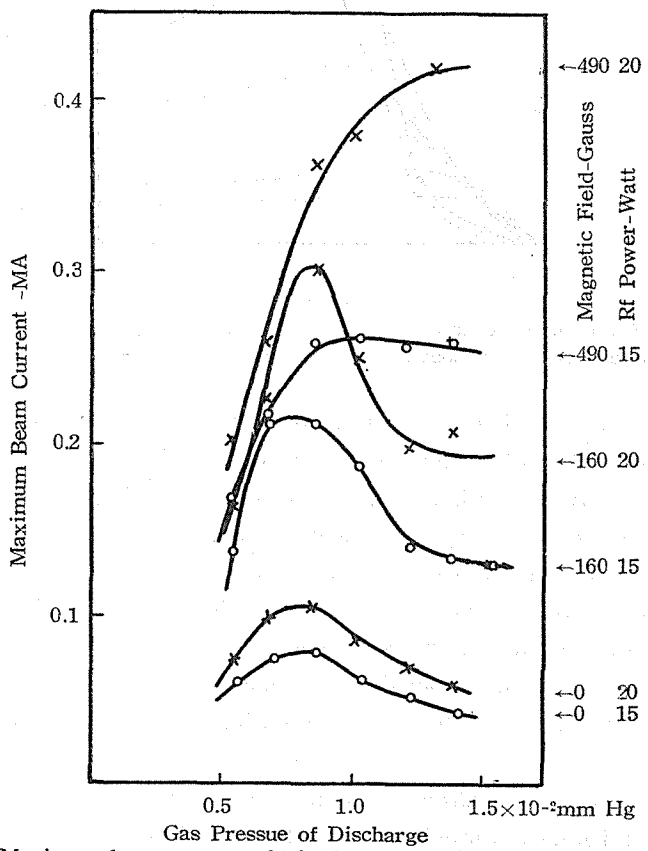

Fig. 1. Maximum beam current obtained as a function of gas pressure, magnetic field and rf power input for the best setting of probe potential.

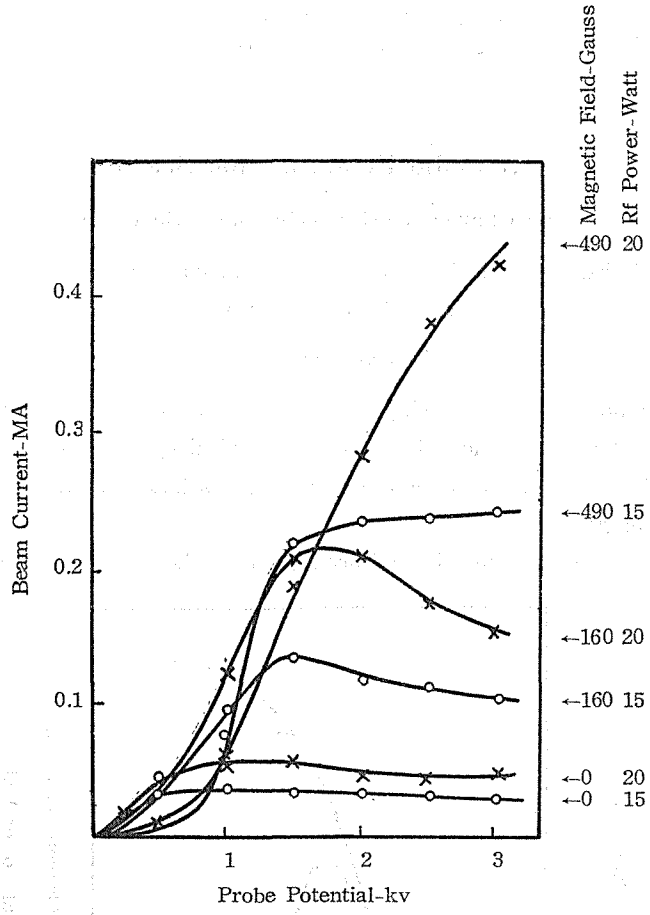

Fig. 2. Beam current characteristics as a function of probe potential, magnetic tield and rf power input for gas pressure of 2.3×10^{-2}mm Hg.

mm. and the length was 120 mm. The secondary electrons were suppressed effectively by a suppressor disk with an aperture of 20 mm. in diameter.

The magnetic field, which was produced by a solenoid and a combination of four permanent magnets settled near the canal, was applied coaxially to the ion source. The total bceam current characteristics were studied as a function of magnetic field, rf power input, probe voltage and gas pressure of discharge, in order to find the optimum conditions to get sufficient beam current with the least power consumption. The rf power input was estimated from the input and output power characteristics considering the efficiency of the oscillator, the radiation loss of the system, and the impedance of the load.

The leak quantity of hydrogen gas and the gas pressure of discharge were measured by the continuously variable leak method developed by us. (*Mem. Coll. Sci.*, A, *Kyoto Univ.* **26**, 143 (1950))

These characteristics showed a maximum total beam current of 450 micro ampere

to be obtained with roughly 100 watts of total A. C. power input (including all the oscillator tube and rectifiers) by the use of four permanent magnets arranged as described by Little et al. (*Rev. Sci. Instr.* **23.**, 768, (1952)).

The relation between the maximum beam output and the gas pressure is shown in Fig. 1. For stronger magnetic field and rf power input, the beam current peak widens and shifts to the region of higher gas pressure. The variation of the beam current with the probe voltage is shown in Fig. 2 for various magnetic field and rf power input.

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2. A New Vacuum Disk Valve

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A compact and low impedance vacuum valve has been designed and constructed to install in the evacuating system of ther 400-keV ion accelerator.

The essential part of this valve is a metal disk D rolling on a seesaw S. The disk is easily positioned at I or II (Fig. 1) through the change of the inclination of S

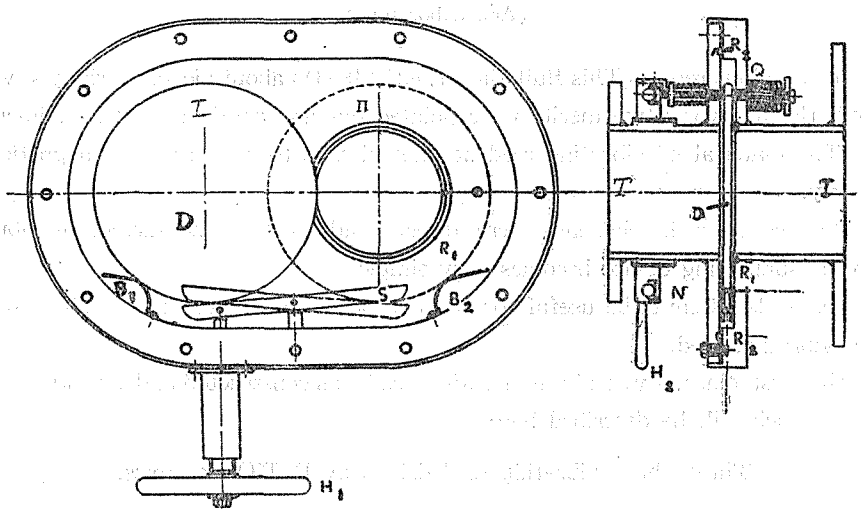

Fig. 1. Schematic diagrams of seesaw disk valve.

R_1,R_2 : Rubber gaskets
D : Metal disk
S : Seesaw
H_1,H_2: Handles
P,Q : Pushing rods
N : Screw
B_1,B_2 : Springs
T : Tube