ION SOURCE WORK AT ANL

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I. Column

In the pursuit of higher beam currents with lower emittance a 500 kV test facility has been constructed. It has been built in such a way that various columns and ion sources can be tried with ease. Figure 1 shows the layout of the development room. Figure 2 shows a column that is presently being tested. It is a 15-inch long constant acceleration type column which is planned for the first section of a future 750 kV column (see Fig. 3). The column section is designed to run at about 250 kV, but as yet has only reached 175 kV.

II. Ion Source

This source shown in Fig. 4 was designed to be small enough to fit in a re-entrant column with an inside diameter of 10 inches. This requirement was met by using formvar-coated copper tubing in the magnet and a small diameter insulator. We use an oxide-coated cathode as has been used in the ZGS preaccelerator for the past two years. The expansion cup has been wound with formvar-coated copper tubing to give us another tuning parameter. The arc modulator is made in two sections so that the filament and intermediate anode voltage can be varied with respect to the anode independently. The modulator is transistorized and has a current capability of 30 A from the intermediate anode to anode. Source parameters are shown in Table I.

We have gotten over 600 mA with this source on a test stand.

III. Results

The column and ion source combination has been run at 575 mA and 120 kV. Crude emittance measurements were made which seem to indicate a beam quality improvement of a factor of 8-10 with a beam intensity increase of a factor of four over our present 750 kV preaccelerator. We expect to make more accurate measurements at various beam conditions later this month.

TABLE I

SOURCE PARAMETERS

Filament Current	15.5 A
Filament Voltage	5.9 V
Magnet Current	130.0 A
Extraction Voltage	20.0 kV
Focus Voltage	40.0 kV
Filament - Anode Voltage	200.0 V
Intermediate Anode - Anode Voltage	70.0 V
Filament - Intermediate Anode Current	12.0 A
Intermediate Anode - Anode Current	24.0 A
Source Press	0.2 Torr
Beam Current	400.0 mA
Acceleration Voltage	130.0 kV
Aperture	Nickel with Copper Tungsten Insert

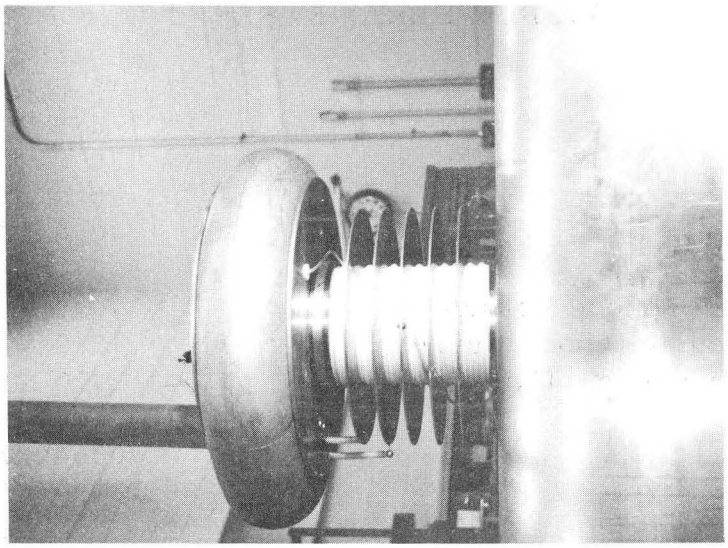

FIG. 2

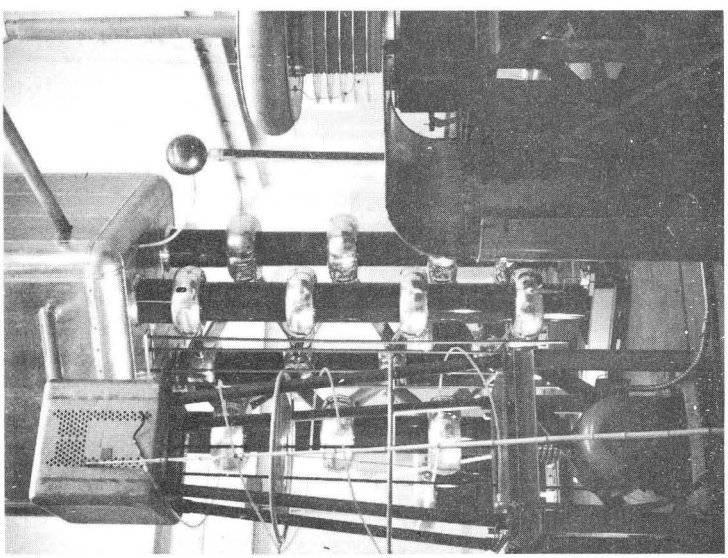

FIG. 1

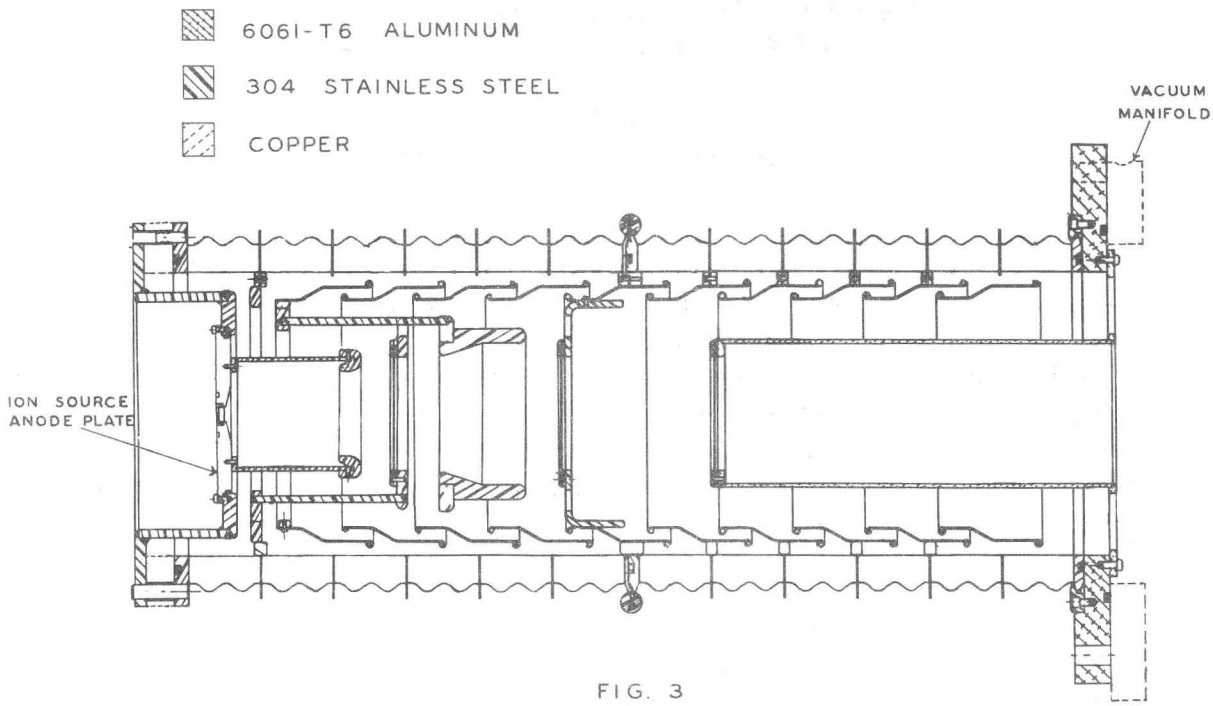
6061-T6 ALUMINUM
304 STAINLESS STEEL
COPPER
VACUUM MANIFOLD
ION SOURCE ANODE PLATE

FIG. 3

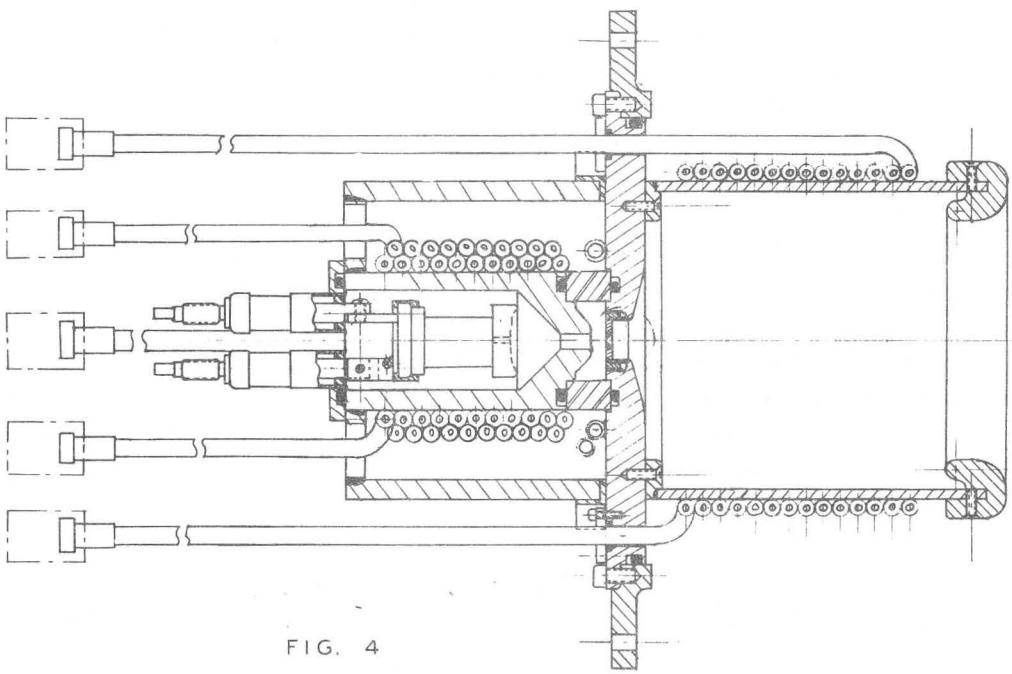

FIG. 4