# LAMB SHIFT TYPE POLARIZED ION SOURCE OF KYOTO UNIVERSITY

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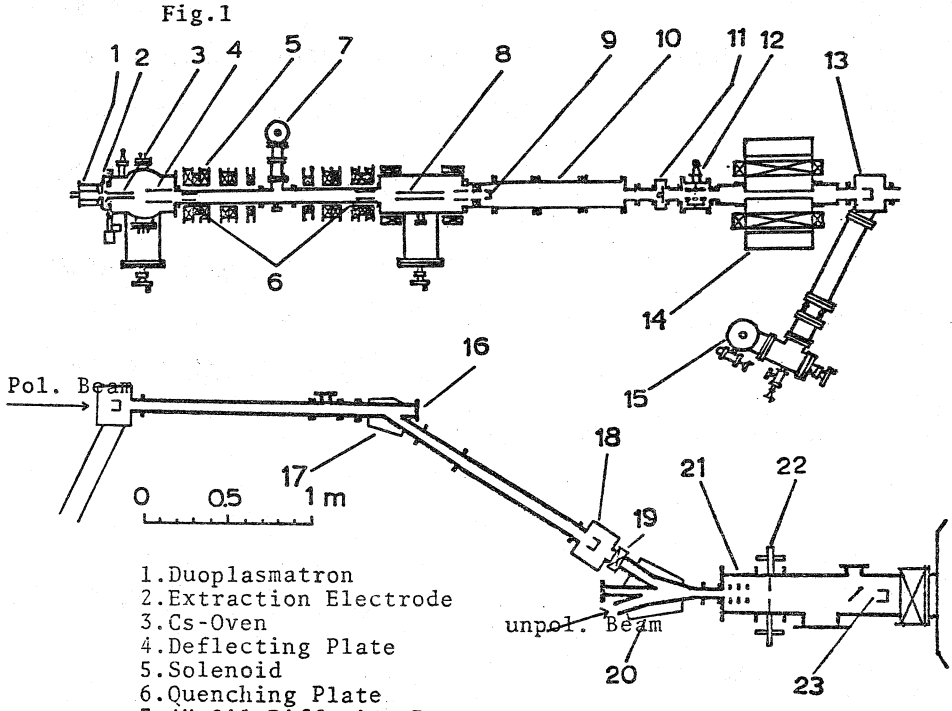
A Lamb-shift polarized ion source is under construction for the Kyoto University tandem Van de Graaff Accelerator (EN equivalent). A schematic diagram of the apparatus is shown in Fig.1. High intensity $H^+$ or $D^+$ beam from a duoplasmatron is accelerated to about 14 kV and decelerated to 500 eV or 1000 eV. The expansion cup of the duoplasmatron has a cone-shape with a slit inside and the 3.0 mm thick extraction plate with a hole of 7.0 mm in diameter is situated 2.5 mm from the duoplasmatron. Deceleration electrode is placed 6.5 mm away from the extraction plate and is cooled with freon 113 in order to prevent the spark between accel-decel electrodes. This beam is focused to a cesium charge exchange canal. The distance between the expansion cup of the duoplasmatron and the cesium canal is 11 cm. Since the magnetic focusing system is not adopted, the position of the accel-decel-electrodes is very critical. Following the cecium canal are defection plates to remove charged components from the beam and the beam enters into the polarization region.

To polarize the metastable component of the beam, the method of sudden field-reversal as suggested by Sona [1] is used. 8 solenoid coils produce the required adiabatic field change and the rapid change of field sign for the metastable atom. By applying the 10 V/cm quenching voltage in the required magnetic field the beam intensity of the negative deuterium is reduced to about 2/3 or 3/5 of the non-quenching case. The power supply of these coils are remote controled to choose the polarization mode of operation.

The polarized metastable atoms are selectively ionized in a 25 cm length argon charge exchange canal with holes of 15 mm in diameter. And the emerged polarized $H^-$ or $D^-$ ions are pre-accelerated to inject into the accelerator. The obtained beam intensity of the polarized deuteron is now 5 nA. Prior to the injection the polarization axis of the beam is changed by a Wien-Filter to suit the experimental requirements. At present the efficienty of the Wien Filter is not good due to the lack of the electric field homogeneity and the beam intensity is reduced more than one order. The polarized source is operated at -40 kV with respect to ground. Freon gas heat exchanger is used to cool the water bath at the high potential side. The ion souce and the injection system are still under developments and testing.

Fig.1




1.Duoplasmatron
2.Extraction Electrode
3.Cs-Oven
4.Deflecting Plate
5.Solenoid
6.Quenching Plate
7.4"-Oil Diffusion Pump
8.Argon Canal
9.13.23.18.Faraday Cup
10.Accelerating Tube
11.Gate Valve
12.21.Einzel Lens
14.Wien Filter
15.6"-Diffusion Pump
16.Viewer
17.2-Way Magnet
20.3-Way Magnet
22.Slit

[1] P. G. Sona, Energia Nucleare 14 (1967) 295.