PRESENT STATUS OF THE VARIABLE FREQUENCY HEAVY ION LINAC, RILAC

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Abstract

Design of the RILAC is briefly described together with its development and constructional work until March 1978.

General

In these several years desire to use ion beams of heavy elements is increasing in Japan not only among the nuclear physicist but also among the other people of various basic and applied research. RILAC under construction at Riken has been planned to meet those demands by accelerating ions of the elements throughout the periodic table. Particular attention is paid to secure acceleration of the medium and heavier solid elements as well as elements in gaseous state. In order to realize this object the scheme of a variable frequency linac with a large external ion source terminal was proposed. The linac permits use of the positive multiply charged ion source which is well developed and is known to be able to yield ions of any elements. The large terminal in the atmospheric pressure can accomodate almost any complex or large sized ion source known at present. Also the variable frequency scheme allows use of low frequency for heavier ions having small charge to mass ratio and high frequency for lighter elements. The method permits acceleration of the all elements without stringent demend for the accelerating field or without sacrificing the achievable energy of the light elements.

Other features of the RILAC are as follow.

1) For most of the scheduled frequency range, its operation can be made continuous.
2) Energy is variable
3) If the charge state of ions be increased by future progress of the ion source technology, the output energy of the heavier particles can be increased in proportion to the number of charge.

Development and construction work

Many developmental works have been made from the beginning of design study of this project in 1972 and some of them are still continuing. Following is a list of the important ones.

1) Determination of the type and parameters of the variable frequency resonator.
2) Development of the focusing lenses suitable for variable frequency operation
3) Development of the high power variable frequency exciters.
4) Development of the control system for the multi-cavity variable frequency operation.
5) Development of the multiply charged heavy ion source for heavy elements.

All the accelerating cavities and the first high power exciter unit have been already installed and various tests are being made. Remaining rf units and the beam transport system will be installed before June next year and acceleration test will begin in autumn 1979. Table 1 shows design energy and intensity at the exit of the accelerator.

Table 1 ; Design energy and intensity at the exit of the accelerator.

Ion	Charge state	Max energy	Intensity
Ne	4+	80 MeV	$\sim 1.2 \times 10^{12}$ /sec
Kr	8+	160 MeV	$\sim 7 \times 10^{11}$ /sec
Xe	9+	180 MeV	$\sim 3 \times 10^{11}$ /sec