PRESENT STATUS OF THE JAERI TANDEM ACCELERATOR

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Abstract

The installation of the JAERI tandem accelerator was finished in August at Tokai Research Establishment of Japan Atomic Energy Research Institute. It is the folded type tandem electrostatic accelerator manufactured by National Electrostatics Corp. in Wisconsin USA. All guaranteed performances were satisfied except the tube voltage rating by June and the accelerator has been running for many kinds of experiments since this September.

Some features of the accelerator, results of the beam tests and present behavior of the accelerator are described.

Feature of the accelerator

The accelerator is a vertical tandem electrostatic accelerator of the folded construction. The low energy and high energy accelerating tubes are housed in a same insulating column. The accelerator is capable of accelerating ions with masses from 1 to 240 amu, at terminal voltages of 2.5 to 20 MV. To generate many kinds of ions, the negative ion injector system is provided with four different negative ion sources, the PIG source, the duoplasmatron source, the charge exchange Helium source and the sputter cone source. In the high voltage terminal is provided a positive duoplasmatron source with nanosecond pulsing system to obtain intense pulsed beams. The low energy beam line also has a nanosecond pulsing system for light and heavy ions.

The accelerator is controled through a digital communication system with serial CAMAC highways which are extended by light links to the high potential region. Therefore all electric components located inside the pressure vessel are protected by means of double shielding from high voltage discharges. Figure-1 shows the beam handling components.

Beam tests

All ion beam demonstration tests were performed by this June successfuly. The results are shown in table 1. These performances were kept more than 2 hours. Behavior of the pulsed beam was observed by means of gamma ray detection in nuclear reactions or direct observation of pulses from a fast Faraday cup at a target room.

Behavior of the accelerator

The accelerator has been running for about 8000 hours (Charging chain timer) so far. The scheduled accelerator operation has been continued since September 1, 1982. The operation period per week is 120 hours from Monday morning to Saturday morning. Now the accelerator is running nicely without serious troubles.

Maximum operating voltage is around 18 to 18.5 MV. It plausibly depends on ion species and beam current values.

The beam transport system including the acceleration tubes has fairly good beam transmission. Typical current values along the beam line listed in table 2.

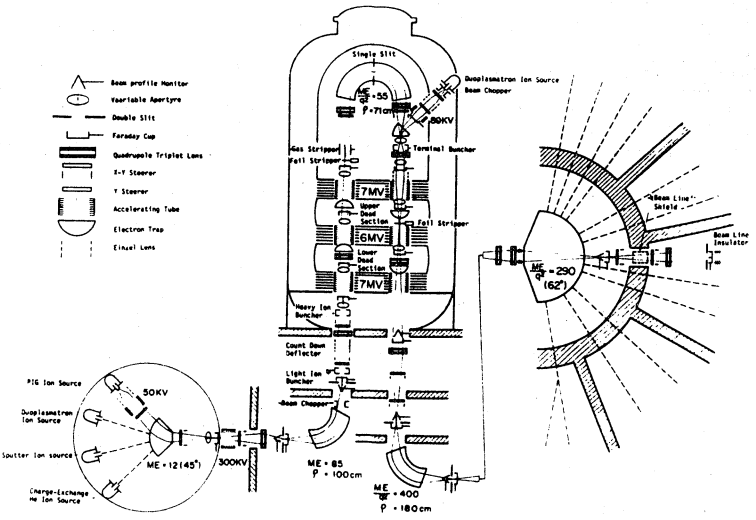

Fig-1 JAERI Tandem Accelerator Beam Handling System

table-1

Beam demonstration test data

ION SPECIES	TERMINAL VOLTAGE	ANALYZED BEAM CURRENT	
DC BEAM			
H^+	2.5 MV	4 puA	
	13	7.9	
	18	5	
$_{35}Cl^{7+}$	5	0.21	
$_{35}Cl^{8+}$	13	0.50	
$_{35}Cl^{9+}$	18	0.53	
$_{127}I^{4+}$	5	0.20	
$_{127}I^{7+}$	13	0.54	
	18	0.54	
PULSED BEAM FROM THE LOW ENERGY LINE		(PEAK)	(FWHM)
H^+	2.5	0.3 mA	0.6 ns
	13	0.8	0.4
	18	0.8	0.4
$_{127}I^{5+}$	5	1.2 μA	3
$_{127}I^{7+}$	13	10	2.5
	18	12	1.9
PULSED BEAM FROM THE TERMINAL SOURCE		(PEAK)	(FWHM)
H^+	5	4.1 mA	0.8 ns
	13	4.0	0.6
	18	1.1	0.9
H_2^+ SIMULATION OF D^+	5	4.2	0.8
	13	4.0	1.0
	18	1.2	0.8

table-2

Typical currents value along the beam line

ION SPECIES	INJECTED BEAM CUR.	ANALYZED BEAM CUR.	TERMINAL VOLTAGE	ION SOURCE	STRIPPER
$_{12}C$	-6 uA	1.2 (5^+) puA	16.5 MV	SCS	10ug/cm² CARBON FOIL
$_{16}O$	-5	1.0 (6^+)	17.5	PIG	"
$_{63}Cu$	-0.1	0.01 (10^+)	13.0	SCS	"
$_{58}Ni$	-0.5	0.02 (11^+)	13.65	SCS	"