FUSION NEUTRONICS SOURCE(FNS)

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The FNS is a high intensity 14 MeV neutron source installed for the purpose of studying the neutronics on D-T fusion reactor blanket and shielding. It provides following three functions to meet the experimental requirements.

a) High intensity DC point source
b) DC point source with large variation of neutron yield rate
c) Pulsed neutron source ranging from nS to μS

The FNS is basically a combination of a 400 keV deuteron ion accelerator of high intensity DC and pulsed beam, and tritium metal target assemblies which have large cooling ability.

The accelerator is constructed from following equipments.

a) A cascaded trasformer type high voltage power supply that is capable of delivering up to 80 mA at 450kV
b) A 25kVA motor generator type auxiliary power supply for terminal
c) A high voltage terminal deck that contains two Duoplasmatron ion sources(GIC 740A & 820), 90° analyzing magnets, terminal lenses, pre-acceleration pulsing components, vacuum systems etc.
d) An accelerator tube designed to be as short as practicable to avoid beam spread due to space charge effect in the tube
e) Two beam transport lines(A & B) that include vacuum systems, Q lenses, steering devices, post-acceleration pulsing systems, insertable Faraday cups, beam profile monitor etc.
f) A control desk and a rear console that has a diagrammatical display for operation and interlocks

The beam specifications for FNS accelerator are shown in table 1.

a) High intensity DC mode (A beam line)

Beam current : > 20 mA

Beam size : ≤ 15 mmϕ

b) Low intensity DC mode (B beam line)

Beam current : > 3 mA

Beam size : < 15 mmϕ

c) Pulsed mode (B beam line)

	For Bunching	For Sweeping	For Arc-Pulsing
Pulse width	: 2 ns	20 ns ∿ 8 μs	5, 10 μs
Pulse interval	: 0.5 ∿ 256 μs	2 ∿ 512 μs	1 ms ∿ ∞
Peak current	: > 35 mA	> 3 mA	> 5 mA
on/off ratio	: > 10^5	> 10^4	> 10^4

Table 1 The spec. of D beam current at target position

The A beam transport line is a straight one and leads to a small cell heavily shielded by 2.5 m thick concrete wall. This target room is used for sample irradiation and fast neutron sielding experiment.

The B beam line is deflected by 80° at twin 40° bending magnets to lead to a large target room where the integral experiment on bulk media such as lithium containing fusion blanket mock-up or shielding bench-mark test are performed.

The characteristics of target assemblies is shown in table 2

Type	Rotating Target		Stationary Target	
	LLL Type	Multivolt	High Speed Water-cooled	Air-cooled
Size	230 mmφ	198 mmφ	35 mm □	29 mmφ
Revolution	1100 rpm	150 ∿ 450 rpm	---	---
Dissipation	15 kW	5 kW	1 kW	20 W
Tritium	1800 Ci	350 Ci	20 Ci	10 Ci

Table 2 The characteristics of target assemblies

Factory demonstration test was performed in this February. For the combination of 740A high current ion source and the A beam transport, 40 mA and 14.5 mA of H^+ beam were obtained at insertable Faraday cups just after the acceleration tube and in front of target respectively.

The corresponding numbers were 6 mA and 2.8 mA for the combination of 820 low current ion source and the B beam line. The results were a little lower than the specified values mainly because of insufficient beam axis alignment,but this was expected to be improved in the installation at JAERI FNS building.

The assembling of the accelerator was begun at the end of April in FNS site and the first beam passed to the target position in the A beam line at the end of June. The beam adjustment to get the rated current and pulse specifications is now in progress.

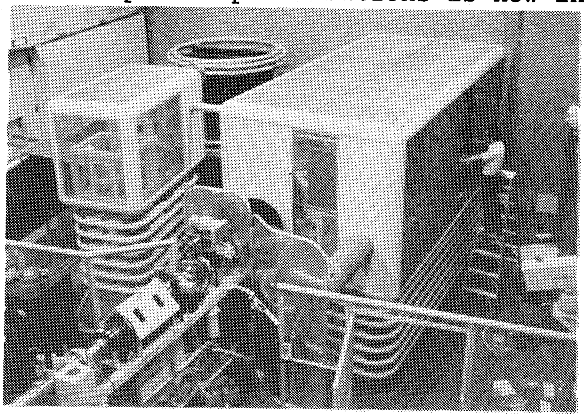

Fig. 1 The FNS accelerator