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A MODIFICATION TO THE ION SOURCE PULSING SYSTEM OF A PN-400 VAN DE GRAAFF ACCELERATOR

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Simple modifications to the pulsing system of a PN-400 Van de Graaff accelerator are described. An LED at ground is driven by a low power pulse generator and is coupled to a photosensitive transistor (PST) in the high tension terminal using a perspex light guide. After suitable signal amplification, the output from the PST is used to switch the ion source RF generator. Monitoring of the ion source light intensity is effected by using a second PST at ground coupled to the ion source using a second perspex light guide.

Simple modifications have been made to the PN-400 Van de Graaff accelerator, manufactured by the High Voltage Corporation, Inc., which enable the ion source to be pulsed by a low power pulse generator operated at ground potential. A schematic of the system is shown in fig. 1.

The pulse characteristics – repetition frequency, and mark-to-space ratio – of the pulse generator are made equal to the corresponding desired values of the neutron pulses produced by the accelerator. Pulsing of the ion source is effected by switching the grid voltage of the RF oscillator between +85 V (ON) and −65 V (OFF). This switching voltage is in turn provided by a two-state voltage amplifier switched by a

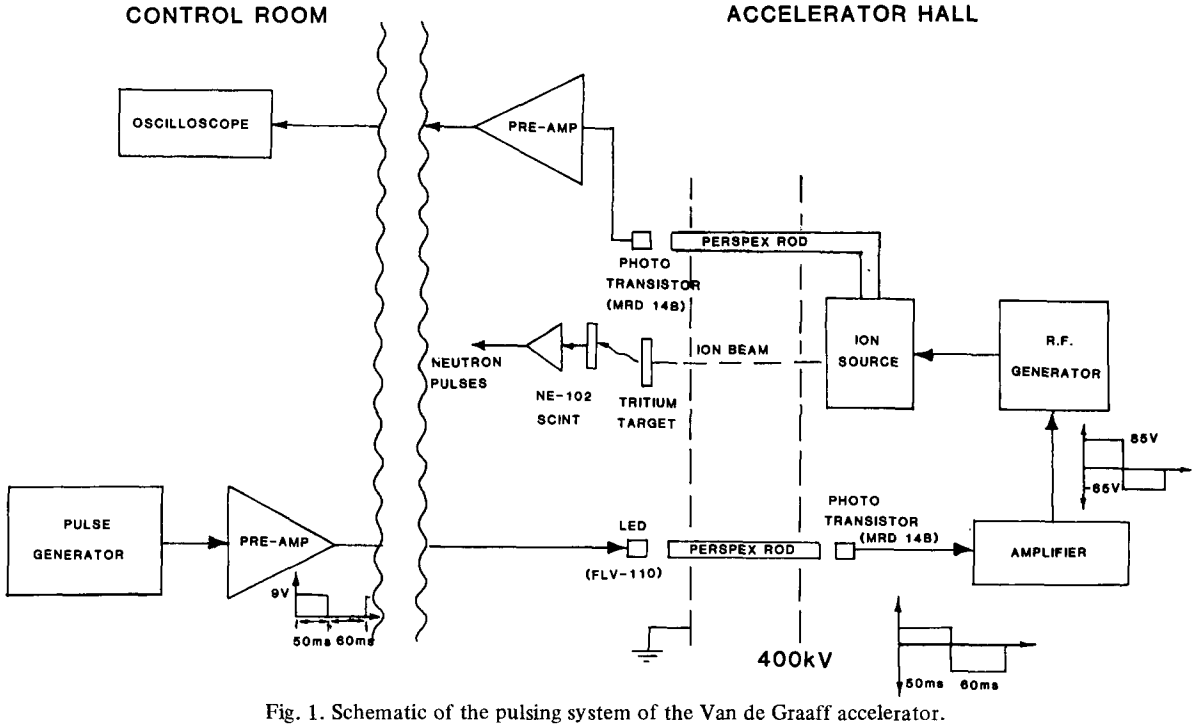

Fig. 1. Schematic of the pulsing system of the Van de Graaff accelerator.

Table 1

Time relationship between driving pulser pulses and output neutron pulses (pulser pulses, $t_{rise} = 6\ \mu s$, $t_{fall} = 20\ \mu s$; neutron pulses, t_{rise} and t_{fall} <0.05 ms)

t_1 (ms)	t_2 (ms)	t_3 (ms)	t_4 (ms)
400	50	2	0.7
50	450	2.5	0.8
1	4	0.9	0.2
4	1	2.50	0.65

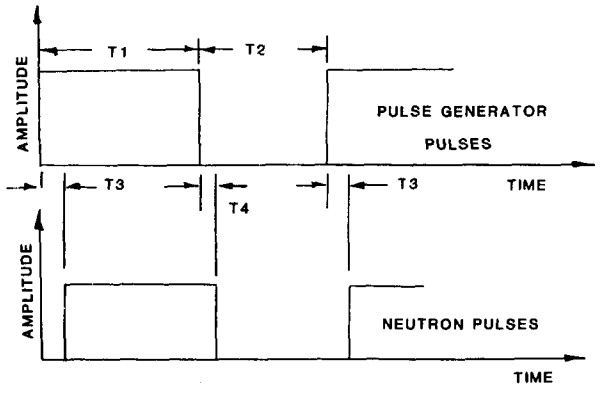

photo transistor driven in the ON and OFF states by the light emitted from a LED fixed to the grounded base plate of the accelerator. A Perspex rod (diameter 141 mm, length 500 mm) optically couples the LED and photo transistor.

Confirmation of the ion source pulsing is effected using a second photo transistor optically coupled by a perspex rod to the light emission of the ion source. The signal from this monitor transistor is amplified prior to transmission via co-axial cable some 30 m to the accelerator control room. The neutron pulses were measured with an NE102 scintillator coupled to a fast photomultiplier.

Table 1 shows the conditions under which the pulsing system was verified. It is noted that the rise and fall times of the neutron pulse (<0.05 ms) is independent of the driving pulse length, but the delay time of the neutron pulse appears to be reduced for short ($\simeq$1 ms) driving pulses.