DESIGN AND CONSTRUCTION OF A 35 MeV ELECTRON LINEAR ACCELERATOR AT NUCLEAR ENGINEERING RESEARCH LABORATORY

Yoneho Tabata, Jiro Tanaka*, Seiichi Tagawa, and Kenichi Hasegawa

Faculty of Engineering, University of Tokyo
*Institute for High Energy Physics

The specifications of the 35 MeV LINAC-LERL are described in Table 1.

Table 1. Main Specifications of Todai 35 MeV LINAC

I. Steady Mode

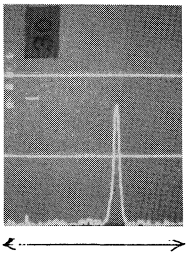
Energy	Current
35 MeV	0
25 MeV	200 mA

Duration of pulse: 0.1, 0.5, 1.0, 4.0 μs
Repetition : 10 ∼ 200 pps

Single shot operation and external triggering are possible.

II. Trainsient Mode

Beam current : 2 A
Duration of pulse : 2 ns, 10 ns
Bunching width : 20 ps
Beam diameter : 4 mmϕ
Current fluctuation : ±3%/5 min
1/6RF mode : 1 nc/fine pulse
Single pulse : 300 pc (1 nc)



1.2 ns

A single shot
< 18 ps

The layout of the machine components and the facilities is shown in Figure 1.

The beam loading curves are given in Figure 2. The results are indicating that all specifications are fully satisfied.

In order to get a very narrow single pulse (less than 20 pico-second) with a high current (more than 1 nc), a subharmonic (1/6RF of 2856 MHz:S-band) buncher has been added to the LINAC system as one of the acceleration steps of electron beam. It has been tried to minimize tha satellite pulses and those have been eliminated successfully. A very nice single pulse has been obtained, as shown in the photograph. It is necessary to have an intense electron emmission pulse from the electron gun in order to get single pulse with a high electric charge. The electron gun has been specially designed for the specific purpose.

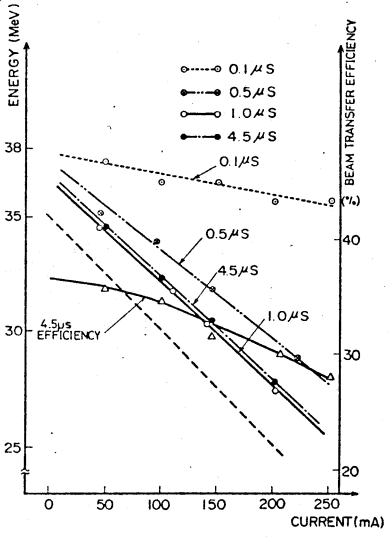
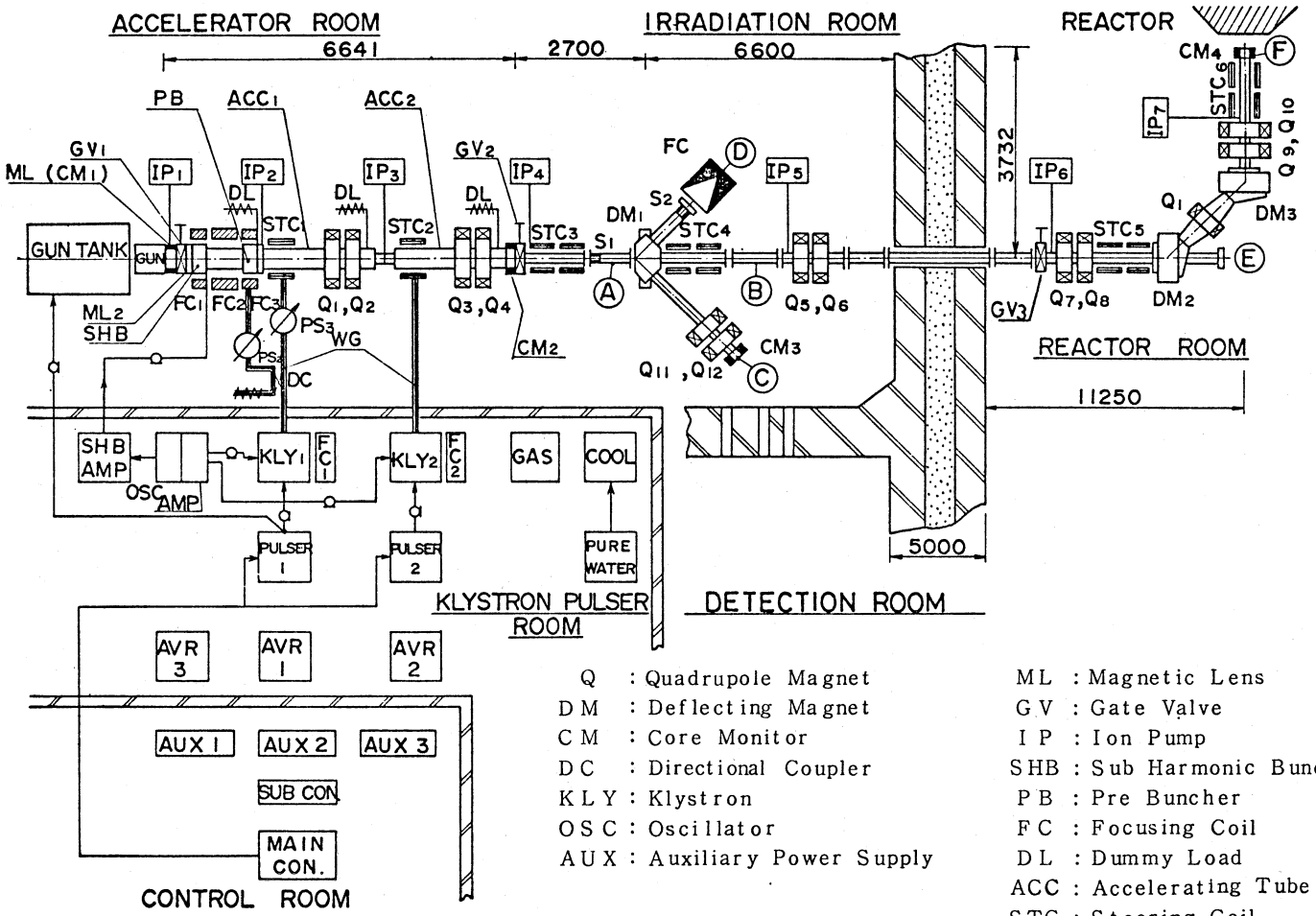


Fig.2 Beam loading curves



Q	: Quadrupole Magnet	ML	: Magnetic Lens
DM	: Deflecting Magnet	GV	: Gate Valve
CM	: Core Monitor	IP	: Ion Pump
DC	: Directional Coupler	SHB	: Sub Harmonic Buncher
KLY	: Klystron	PB	: Pre Buncher
OSC	: Oscillator	FC	: Focusing Coil
AUX	: Auxiliary Power Supply	DL	: Dummy Load
		ACC	: Accelerating Tube
		STC	: Steering Coil

Fig. 1 Layout of the facility