

Section 11 VLER Injection System

The injection system for the VLER is a 500 MeV linear accelerator combined with a pulsed thermionic gun. A layout of the injection system is shown in Figure 11-1 and the injection parameters are listed in Table 11-1. The injection straight section in VLER is shown in Fig. 11-2, and the injection magnet settings are in Table 11-2. The electrons are emitted from a gun and accelerated in two four-section accelerators. Each four-section accelerator is powered by a klystron and modulator removed from the linac in Sector 20. Each section is SLEDED to produce 250 MeV of acceleration as is routine in the SLAC linac.

The linac is mounted on the floor of the IR12 hall inside the radiation shielding. There are two 180 degree bends in the linac. The first is a horizontal bend and is half way along the linac to match the linac geometry to that of the collider hall. The beam passes under the “bridge” passageway of PEP-II. The second is a vertical bend and is at the end of the linac to bring the beam from floor level to the VLER level. The beam is injected into the ring using a transient orbit bump in the ring with three pulsed dipoles. The injected beam enters through a DC septum.

The existing accelerator structures for the linac are shown in Figure 11-3. Existing quadrupoles for the linac are shown in Figure 11-4. The dipole bends are magnets identical to SLAC Damping Ring dipoles as seen in Figure 11-5. The klystrons and modulators exist and come from the linac in Sector 20 where they are no longer needed for PEP-II injection or LCLS operation.

This injector needs to produce up to 2.2×10^9 electrons per pulse in a single bunch. The gun and accelerator can easily produce ten times the charge per bunch and accelerate several such bunches simultaneously. The linac pulse rate will be 1 Hz to save costs on the power source and radiation shielding. The klystron and accelerator sections could be operated up to 120 Hz if needed.

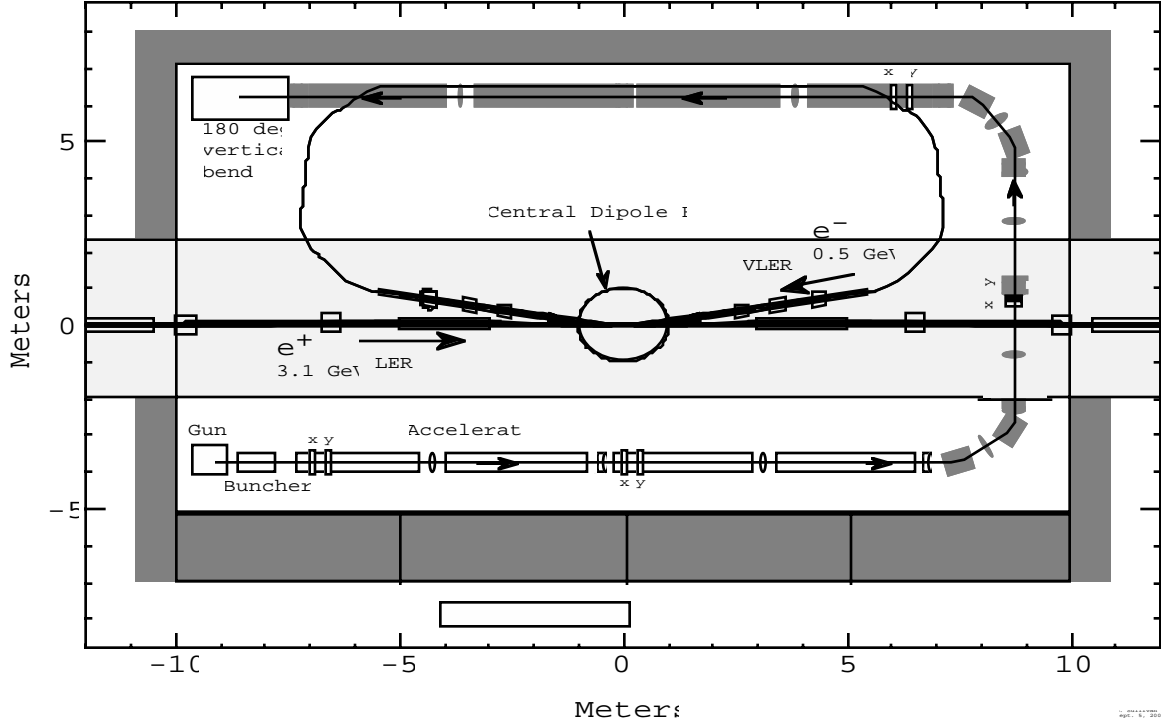


Fig. 11-1: Layout of IR12 with the accelerator for the VLER. The accelerator sections lie below the VLER and pass through a passageway located under the concrete bridge.

Table 11-1: Parameters for VLER injector.

Parameter	Units	Nominal value	Maximum value
Linac Energy	MeV	300	500
N. of accelerating structures		8	
Accelerating gradient	MeV/m	12.5	
Length of acc. structure	m	3	3
Pulse rate	Hz	1	120
Part./bunch starting in Linac	$\times 10^9$	5	50
Total Part/pulse in Linac	$\times 10^9$	5	100
N. of bunches/pulse		1	26
Injection efficiency	%	44	95
Injection time	sec	26	1
VLER part./bunch	$\times 10^9$	1.13	2.26

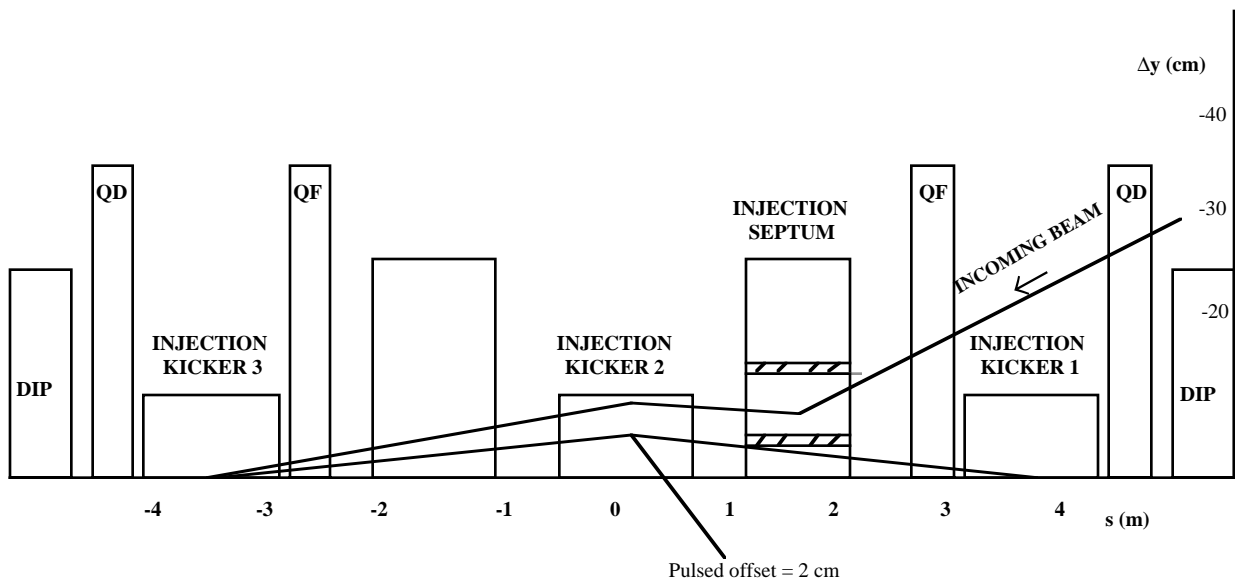


Fig. 11-2: Injection straight section in VLER with a pulsed orbit bump.

Table 11-2: Parameters for VLER injection magnets.

MAGNET	ANGLE (mrad)	Int. Field (G x m) @ 500 MeV
Kicker 1	6.2	103.
Kicker 1	12.3	206.
Kicker 1	6.2	103.
Septum	82	1370.



Fig. 11-3: Existing 3-m accelerating sections for the VLER injector.



Fig. 11-4: Existing quadrupoles for the Linac.

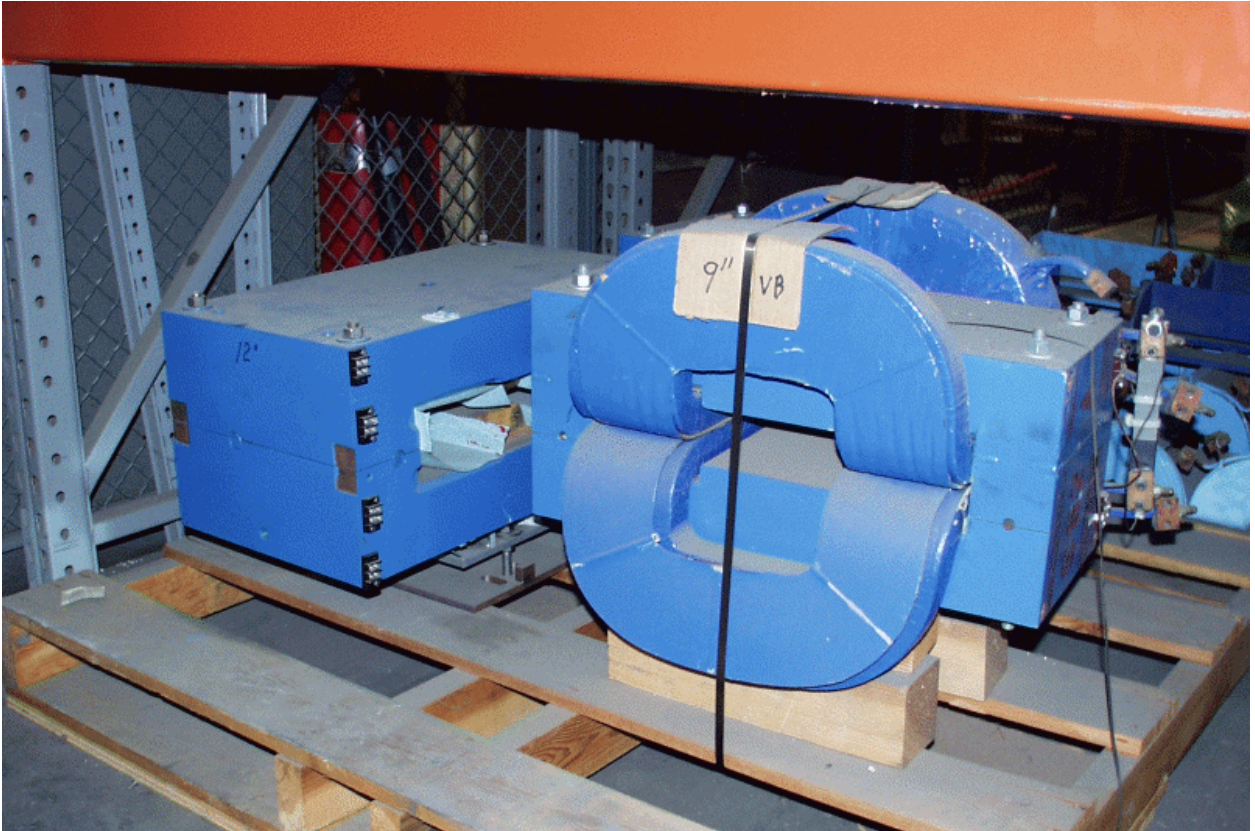


Fig. 11-5: Existing dipole magnets for the injector bends.