

DRAFT

SLAC Test Beam Request:

Purpose of Test:

We wish to demonstrate the mechanical and electrical stability of a prototype BPM-based Energy Spectrometer for use at a future Linear Collider. This test would use the End Station A beamline whose capabilities are particularly-well matched to the studies we would like to make, given that we can produce single or multi-bunch pulses with nearly arbitrary energy spread and/or beam halo. The initial configuration will include several BPMs and toroids on a single girder. Installing these devices in the A line will allow us to determine parameters beyond the single-device resolution such as susceptibility to backgrounds, beam tails, and other environmental effects not accessible or reproducible at other facilities. The overall goal for system stability in the face of these adverse effects is ~ 50 nm over approximately a one hour time scale, a level of electronic and mechanical stability consistent with the expected requirement of 100 nm position stability for an actual energy measurement. We envision this as the first in a series of tests which will culminate in a prototype spectrometer insertion for a LC. In addition to the stability tests, multi-bunch running will allow an exploration of the time resolution of the BPMs. Position resolution along a bunch train can also be explored. (Depending on availability, alternate BPM cavity designs may be explored.)

Description of Test Apparatus:

The test apparatus will include a single 5 meter “girder” on which 4 RF BPMs are mounted. See Figure 1, below. BPMs at the beginning and end of the girder define the beam trajectory, and two BPMs mounted on the same mechanical stage are used as the test BPMs to monitor resolution. The internal pair on the same mount will allow a separation of mechanical and electrical effects in the resolution. The 6-axis moveable stage will also allow us to gauge the effects of beam tilts on the BPM resolution by observing any measurement bias as a function of overall BPM rotation.

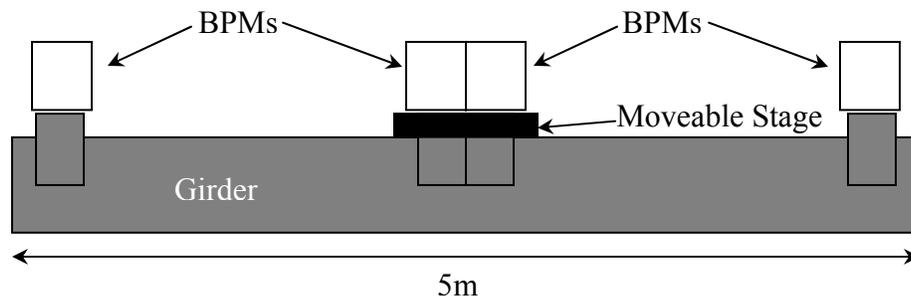


Figure 1. Sketch of the BPM girder and BPM locations.

The specific location of the girder in the End Station is not critical. A possible configuration of beamline components, prepared by Ray Arnold, is shown below in

Figure 2. In particular, the 5 meter region directly downstream of the Target Station would be an acceptable location.

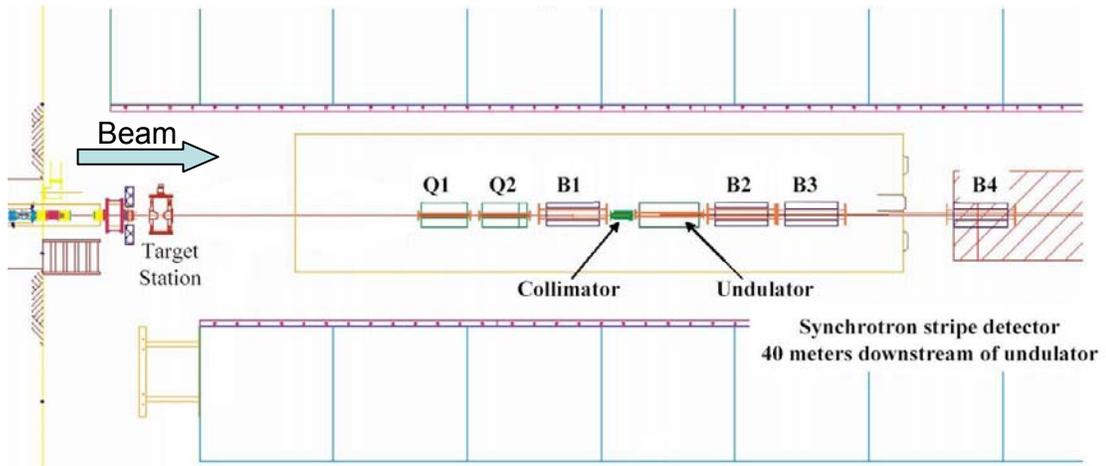


Figure 2. A possible layout of beamline components in End Station A.

Beam Requirements:

Momentum: 25 GeV

Particles: $1 \cdot 10^{10}$ single bunch; $(1-5) \cdot 10^{11}$ in 60-300ns train

Rep. Rate: 10 Hz

$\Delta p/p$: variable ($<1\%$)

Space Requirements:

5 meters for girder insertion

Special Power Requirements:

none

Duration of test and shift utilization:

1 week of beam time? 2 days checkout. 2 days single bunch tests. 3 days tests with long train.

Desired calendar dates:

June 2005