

PRECISE MEASUREMENT OF THE $\pi^+ \rightarrow e^+\nu$ BRANCHING RATIO

Progress Report and Beam Request

The PEN Collaboration

11 January 2007

1. Summary of activities in 2006

Subsequent to the approval of the proposal by the PSI BVR Program Committee in February 2006, the PEN collaboration proceeded to prepare for the short shakedown run scheduled for the July – August 2006 period. These activities included the design and construction of a set of new beam detectors: upstream Beam tag, a single new thick active collimator, a small-diameter thin degrader, and a two-component active target detector consisting of a fast-scintillator central disc and a thin slow-scintillator cylindrical shield which also doubles as a light guide (Fig. 1). The beam detectors were to be read out by a fast waveform digitizing system; we selected the Acqiris DC282 High-Speed 10-bit PXI/CompactPCI digitizer system.

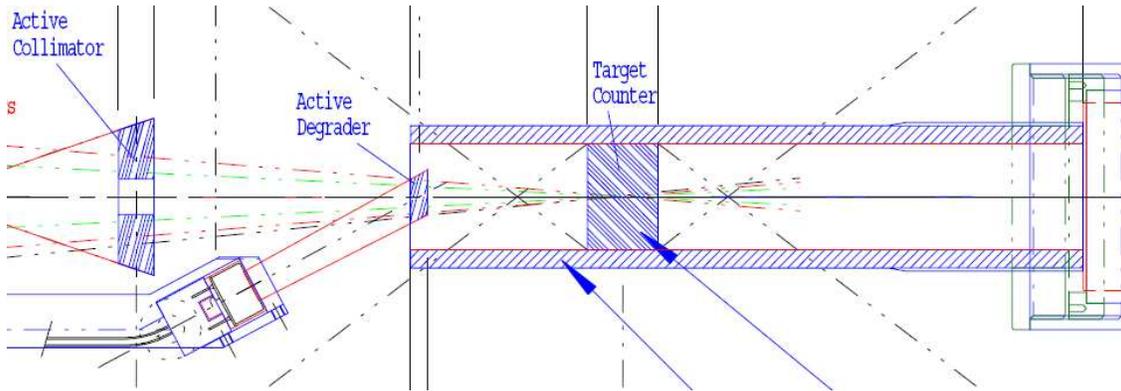


Figure 1: Schematic drawing of the central-region beam detectors redesigned for the 2006 PEN run: the active collimator, degrader, active target (with fast central scintillator and a slow-scintillator cylindrical shield). The upstream Beam tag detector, also redesigned for 2006, is not shown.

Just as importantly, we had to make significant modifications to the data acquisition electronics necessitated by the removal of the old Domino Sampling Chip digitizer system, and by the replacement of the old PSI LB500 programmable trigger logic units with NIM-based modules. Additionally, the Midas DAQ software used in the last PIBETA run in 2004 had become obsolete, which required a major overhaul of the complete DAQ package, coupled with significant hardware changes as well.

Due to difficulties with failing old hardware (particularly the high voltage system, scheduled for imminent replacement), with obtaining new software drivers for our FASTBUS/VME controller, with shaking down hardware problems after a long period of non-use of the system, and with integrating the Acqiris system, the amount of useful beam time was somewhat limited. Nevertheless,

important studies were completed at several beam momenta, which have enabled us to evaluate the new hardware performance and the necessary next steps in its improvement. Besides the 2006 data analysis during the fall 2006 period we have dismantled the central detector region in order to diagnose the cause of the plastic veto (PV) hodoscope's degraded performance. This was determined to be due to age-induced surface crazing, which necessitates the detectors' replacement before true "production" data taking commences.

We will be glad to provide a more detailed report of our activities, findings and plans at the BV38 Meeting, 14–17 February, if required.

2. Resources and beam request

We request three months of data acquisition beam time plus three weeks for set-up and calibration in the $\pi E1$ beam area, i.e., a total of 18 weeks. Given the state of our detector readiness, i.e., the requirement for new PV detectors, we request that this period begin in mid-August and run through mid-December 2007.

There are no major costs associated with the requested run. The main expenditures are the material costs of operating the detector (MWPC gas, supplies).