1 Target Beam Position Monitor (TBPM)

M. Zeier July/Aug. 99

1.1 Working Characteristics

The TBPM was a used to determine the beam position at the target on an event by event basis. Its principle is based on secondary electron monitoring. The beam hits an array of 1mm wide metal stripes (34 stripes: +17,16,...1,-1,-2,...,-17 in each x and y direction) and the produced secondary electrons are collected by anode planes (Metal foils at a voltage of typically +100 V.) The small secondary electron currents are integrated over a certain time ("Integration Time"‘). The intergration is done differentially for pairs of stripes, i.e. the difference in current between two stripes (+1 and -1, +2 and -2, ..., +17 and -17) is integrated, in order to reduce correlated noise. Only currents above a certain threshold are added up over a position sensitive resistor ladder and produce two bipolar current signals that were sent to an ADC in the counting house. In case of an event the measurement was triggered from the counting house electronics and the TBPM itself triggered the ADC gate when the measurement was done. More details can be found in the User Manual (see next section).

1.2 Documentation

- User manual: `cdaqs2:~cdaq/gen98/Documents/sem/sem_#.ps` (each single page a ps file). This document explains basic principles and usage of the TBPM.
- A binder containing drawings and details about the construction. This binder remains with the TBPM.
- A NIM paper about the TBPM will be submitted later this year. A preprint might be obtainable from M. Steinacher (steinacher1@ubaclu.unibas.ch)

1.3 History

No documentation on the initial setup was found.
Changes done to the initial setup:
8/3/98: The two outermost channels in each direction were unplugged because they seemed to be noisier and more sensitive to vibration than the central channels.
8/4/98 (before run 21043): The width of the integration gate was increased from 20μs to 40μs to improve the sensitivity.

1.4 Performance

During G_{en} the TBPM was run at rather low beam current, short integration time (both proportional to the number of secondary electrons produced) and with fast raster on (spreading the beam over more than one foil). Thus the TBPM had to run at lower sensitivity than what it was designed for, which caused noisy behaviour and a bad determination of beam position for a significant fraction of events. Furthermore, if the beam is exactly centered, i.e. produces the same amount of secondary electrons in stripe 1 and -1, the measurement fails because of the concept of differential integration. Fast raster enhances this effect.
It is not possible to increase the integration time much more, because this would start to cause additional dead time in data aquisition. If one detects the raster currents, it is possible to do a calibration of the raster current vs. position with the help of the SEM (doing a linear fit with offset and slope). This is done for the existing data from 1998. This calibration has to be done for each run, because the central beam position defines the offset in the fit. To determine the slope (which should be a constant) more accurately one could think of doing dedicated calibration runs at higher beam current (200 nA) with fast raster off.