Princeton/BaBar/TNDC-96-45
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Proposal for a Drift Chamber Prototype III

Abstract

We propose that a third drift chamber prototype, Prototype III, be constructed consisting of a 1/16 sector of the full chamber. This prototype would have wire length only 30 cm to permit easy installation in test beams, preferably inside a magnet with field parallel to the wires. This prototype would serve as a test facility for electronics integration, including trigger electronics, and for tracking, triggering and dE/dx software. It could be instrumented with preproduction electronics towards the end of 1997, and prototype electronics even earlier.

1 Mechanics

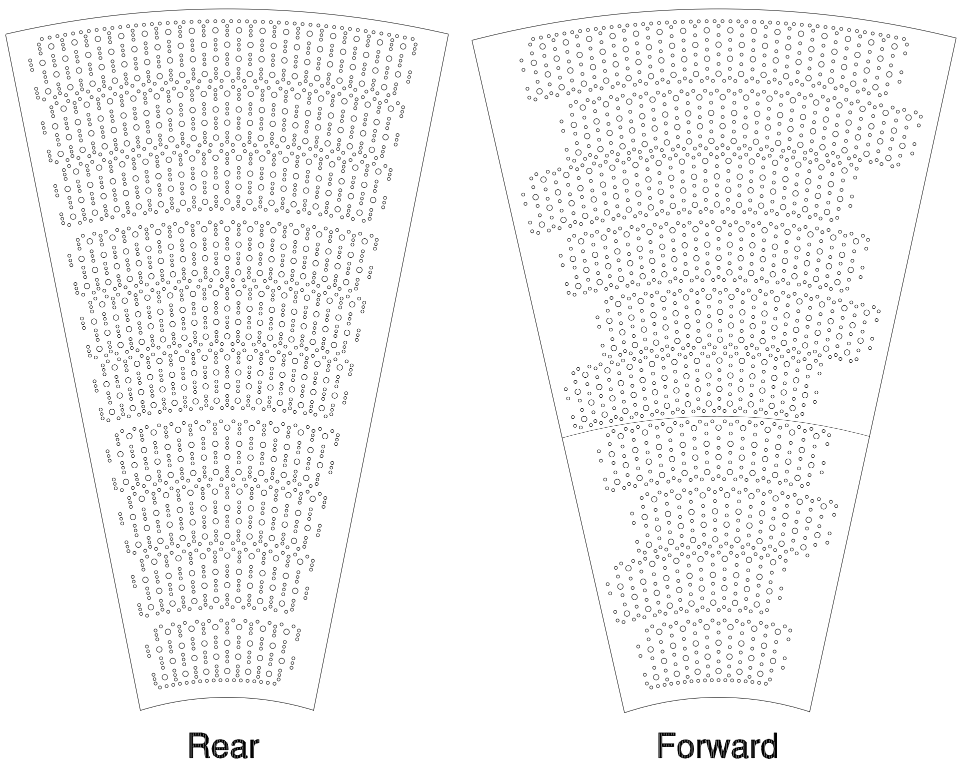

Figure 1: Hole patterns for the endplates of Prototype III, taken to be 1/9 the length of the full chamber.

The endplate hole pattern for Prototype III is shown in Fig. 1. There are $7104/16 = 444$ cells. The hole pattern in the front endplate has the stereo superlayers displaced by amounts so as to give the same stereo angles as in the full chamber.

The endplates could be the test plates fabricated by the endplate drilling vendor, or could be fabricated on a CNC milling machine of modest size.

Prototype III would use feedthroughs and crimp pins from the initial production run for the final chamber, following any modifications from Prototype II experience.

The chamber would use final high- and low-voltage service boards, and prototype or preproduction front-end electronics mounted in final boxes.

Mounting, cabling and cooling of the electronics would utilize the final design. Thus the overall length of Prototype III would be about $40 + 30 + 10 = 80$ cm. Such a chamber could be placed inside a reasonably large C- or H-magnet with field aligned along the wires.

2 Electronics

Prototype III should incorporate the final drift-chamber electronics as this becomes available. High- and low-voltage service boards should be available in early 1997. Quantities of several hundred channels of the preamp and digitization ASICs may not be available until late 1997, but would be used at the earliest possible moment.

To speed up the commissioning of Prototype III we also propose to design and fabricate prototype quantities (up to 500 channels) of front-end electronics using existing commercial components, plus the DIRC TDC chip, in hybrid packaging that would occupy the same volume on the endplate as the baseline electronics. (This would also give experience with a design that could serve as a backup for the ASIC-based electronics should unexpected delays occur in the production of the latter.) A sketch of such hybrid electronics has been given in sec. 3 of Princeton/BaBar/TNDC-96-37. A block diagram is shown in Fig. 2.

3 Rôle of Prototype III

Prototype III is not intended as a prototype of assembly and stringing, which functions are served by Prototype II. It extends the rôle of Prototype II as a testbed for electronics integration, implementing a full radial sector of three electronics supermodules, rather than two azimuthal sectors of the innermost supermodules as in Prototype II.

The full radial extent and compact axial length of Prototype III permit it to be installed in a magnet in a test beam at TRIUMF, BNL or CERN (or more than one of these). This would lead to system tests of tracking, triggering and dE/dx hardware and software. A realistic test of dE/dx could only be accomplished at a few-hundred-MeV/c π/K beam such as at BNL or the CERN PS or SPS. Tracking and triggering studies could be accomplished in a 100-200 MeV/c muon beam at TRIUMF, using a reduced magnetic field to give track curvatures equivalent to higher momenta at full field.

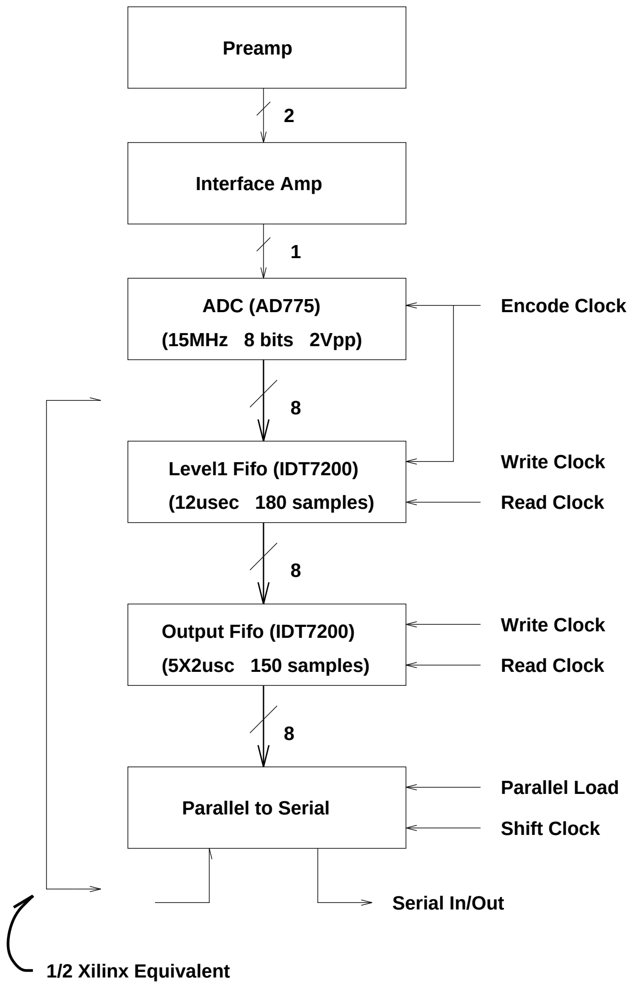

Figure 2: Block diagram of hybrid front-end electronics for Prototype III.