TITLE: UPDATE ON BEAM EXTRACTION $DR-0172-4$

1) Introduction

At the time of the 1981 Workshop on Experimental Use of the SLC, we published an extraction scheme for the MINIQUAD final focus (FF) optics[1]. Since then a different FF optics design has been selected[2]. With the same achromat section and outboard telescope, it allows a number of options for the inboard telescope. This note describes the new extraction system and briefly considers electron-electron extraction and the consequences of an extraction kicker malfunction.

II) Method

Briefly, extraction is accomplished by perturbing the outgoing beam with a pulsed kicker and allowing this perturbation to be magnified by succeeding FF magnets, such that enough spatial offset is generated to allow room for a dc septum magnet to provide the main separation. The following conditions must be satisfactorily balanced to make this scheme work:

1. The distance between the pulsed kicker magnet and the IP must be sufficient to allow for attainable rise times.

2. The location of the kicker and septum must be chosen such that the first order transfer matrix element, $\langle y|y'\rangle$ or $\langle x|x'\rangle$ is large between these magnets. The beam size must be small compared to the offset at the septum, the kick angle must be large enough to provide sufficient offset at the septum but small enough to keep the disrupted beams within FF magnet apertures.

3. Finally, there must be sufficient drift space behind the septum to allow the extracted beam to clear the next FF element.

For the old MINIQUAD optics the above conditions could only be satisfied for extraction in the vertical plane (perpendicular to the FF bend plane). For the more recent FF design it was possible to find a kicker-septum location that would allow extraction in either plane. The new solution has several advantages over the previous one:

1. Instead of having the kicker located in the middle of the achromat as before, it can be further outboard from the IP, in the telescope. This means the system is not as sensitive to e^+e^- energy differences, which was a major problem before. In addition, the kicked beam is not snaking (and scraping) through the final elements of the achromat, which was a problem in the MINIQUAD solution and was very sensitive to assumed disruption angle.

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