

Analysis and optimization of global SVD orbit correction schemes

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Misalignments and field errors are inevitable in particle accelerators, and when uncorrected these can lead to the degradation and loss of the particle beam. The correction of the central particle orbit in the presence of these errors therefore is vital in any accelerator, especially in the Cornell ERL in which the beam is very small and traverses linac sections multiple times. This is typically done by adjusting corrector magnets (CMs) given information supplied by beam position monitors (BPMs), and the most common way to choose the CM strengths is by the singular value decomposition (SVD) of the response matrix.

This project will develop tools in the accelerator simulation code BMAD to analyze the effectiveness of SVD orbit correction using an arbitrary layout of CMs and BPMs, and apply this analysis to a realistic model of the Cornell ERL. Such research will identify the blind spots and limits of a given layout, and aid in finding an optimal orbit correction scheme. A student must be familiar with programming in a Linux environment, and have a good knowledge of linear algebra and probability