Beam Line Tuner for the FAST Linac

Lea Richtmann (Leibniz University Hannover)

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Supervisor: Dan Broemmelsiek (and Jinhao Ruan and Chip Edstrom)

Accelerator Division FAST/IOTA
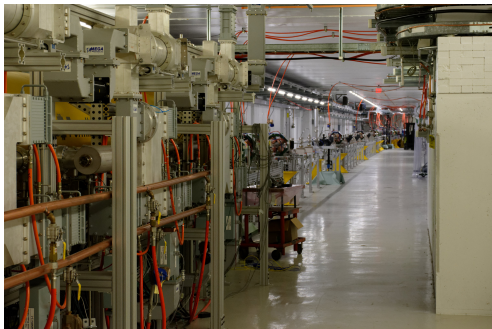
Helen Edwards Internship: 1st Presentation

Outline

Motivation

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- (Find) ideal trajectory through linac
- Measure current trajectory $\Rightarrow$ correct or change
- I want this trajectory $\Rightarrow$ How to change current of correctors to achieve it?
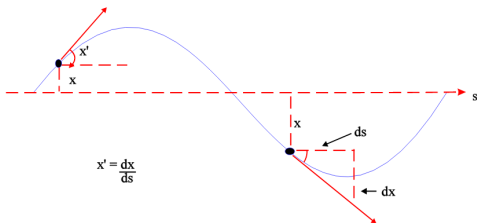
Physical Background

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Description of beam transport with matrix formalism

Example: Drift space of length L:

$$\left.\begin{array}{r} x_{out} = x_{in} + L \cdot x'_{in} \\ x'_{out} = x'_{in} \end{array}\right\} \qquad \begin{pmatrix} x_{out} \\ x'_{out} \end{pmatrix} = \begin{pmatrix} 1 & L \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x_{in} \\ x'_{in} \end{pmatrix}$$

x: position
$x' = \frac{dx}{ds}$: angle

Simulation of beam transport

- For many elements in beamline: Matrix multiplication
- This can be simulated with beam tracking code: elegant
- Create lattice file for specific beamline $\Rightarrow$ track beam
- Or: beamline with offsets $\Rightarrow$ correct beam

Goals and Objectives

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- Learn about beam optics
- Learn how to use elegant program
- Learn to work on Linux cluster
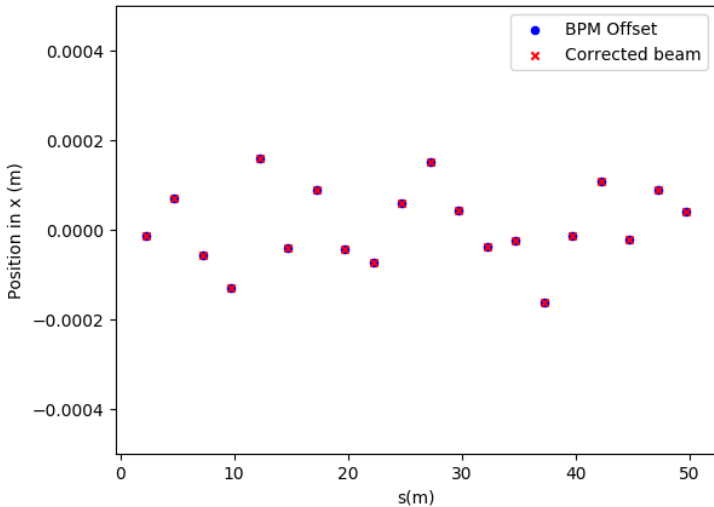- (Hopefully write the beam line tuner)

Achievements so far

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- Basic understanding of elegant
- Running of examples
- Adapt examples to FAST linac injector beam line
- Using python for analysing elegant output files

Correct Beam to BPM Offset

Kick Beam on Different Positions