OPTICS STUDIES FOR THE ATLAS FORWARD PROTON PROJECT

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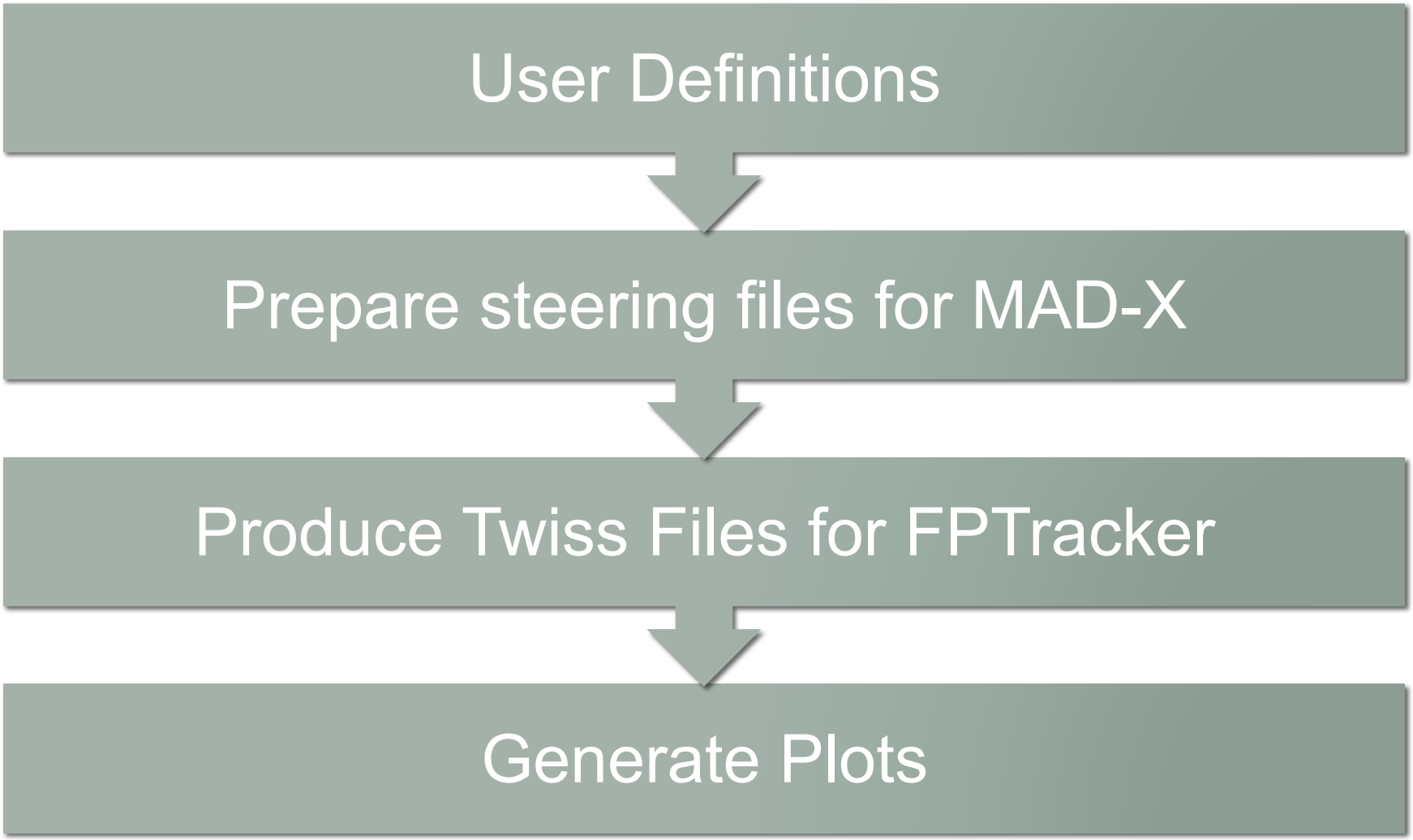
Purpose

To develop a program that can quickly calculate the effects of changing the LHC optics on the AFP detectors.

User Defined

- Beam energy
- Path to MAD-X files:
  - Sequence, Strength, and Aperture
- Crossing Angle
- Nominal Emmitance
- AFP z-positions (4)
- AFP transverse distances (4)
- AFP safety distances (4)
- Collimator transverse distances (4)
- Path to Pythia file

Program Steps

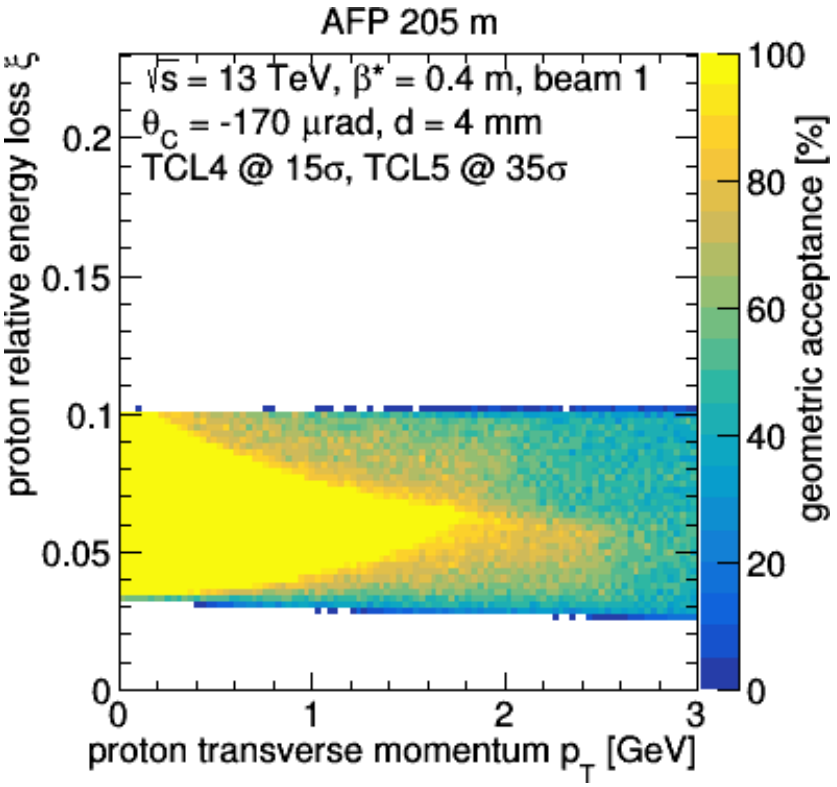


Plots

- Geometric acceptance
- Collimator analysis
  - Maximum relative energy loss depending on collimator settings
  - Change in acceptance depending on individual settings
- Example proton trajectories (varying initial position, momentum, and energy)
- Probability of hitting floor of roman pot
- Single tag and double tag probabilities (as a function of pile-up)
- Parameterization of proton transport
- Proton energy and momentum unfolding resolution

Example Plots

Geometric Acceptance



Maximum ξ for 50% acceptance