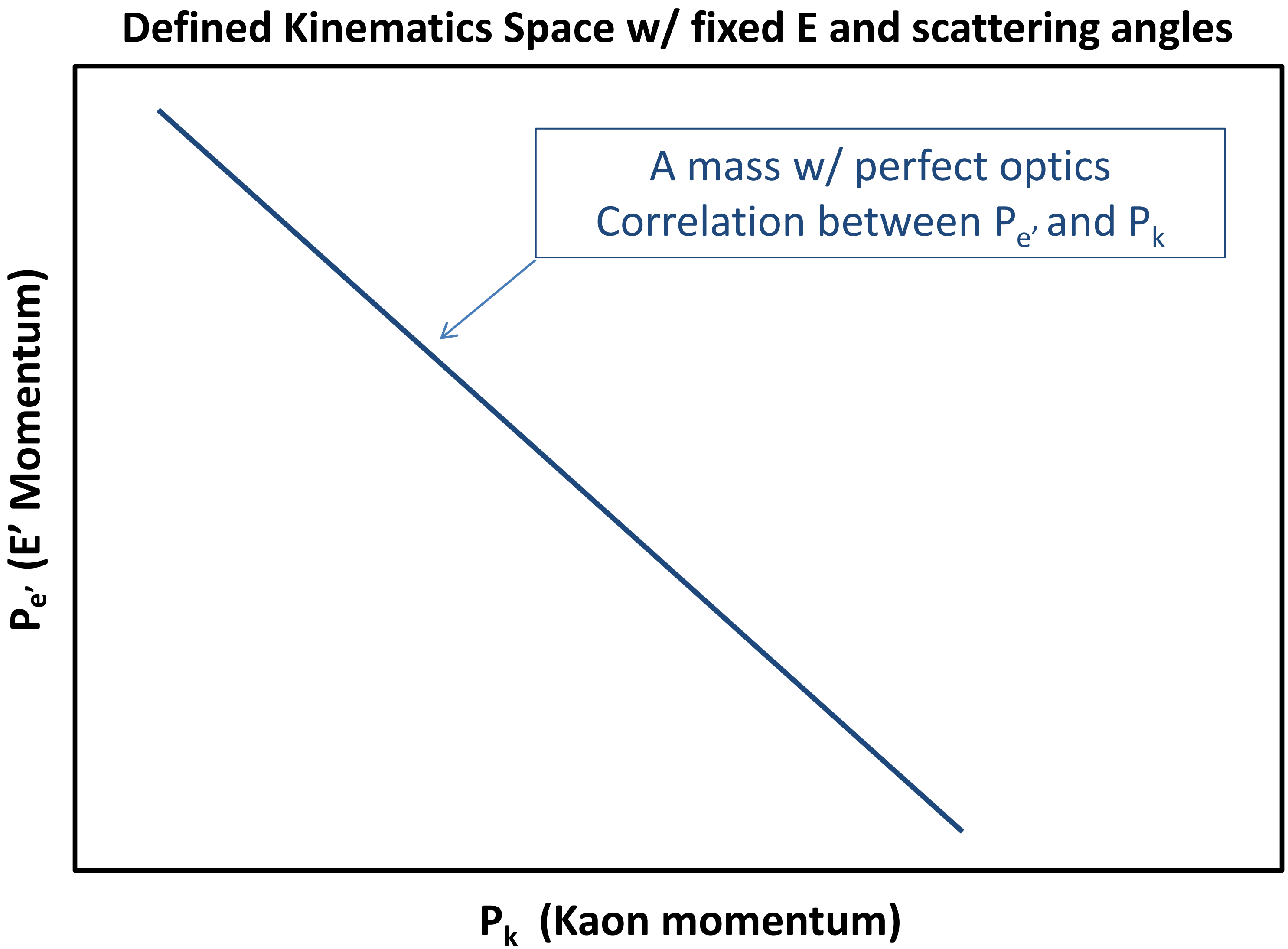
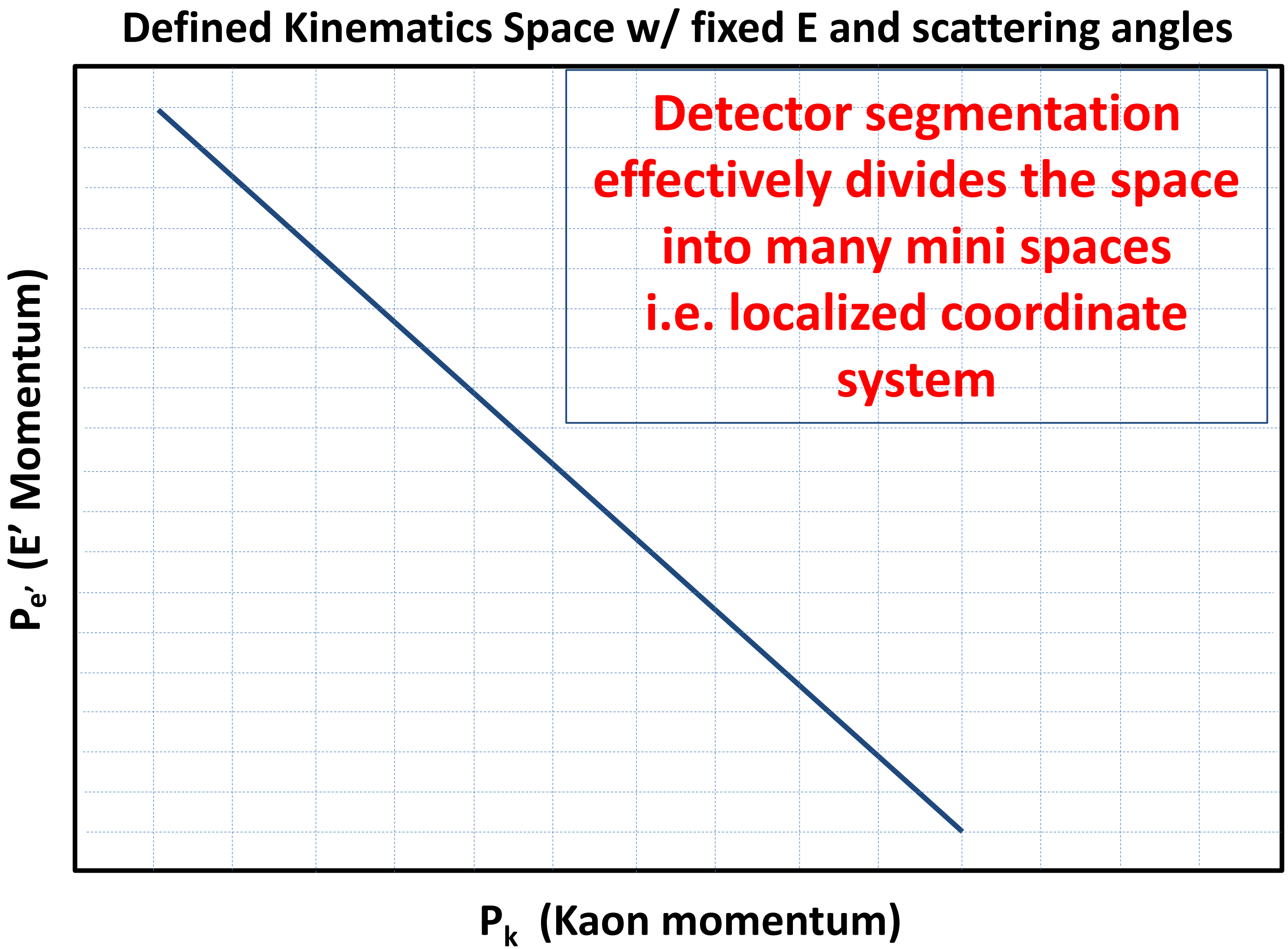
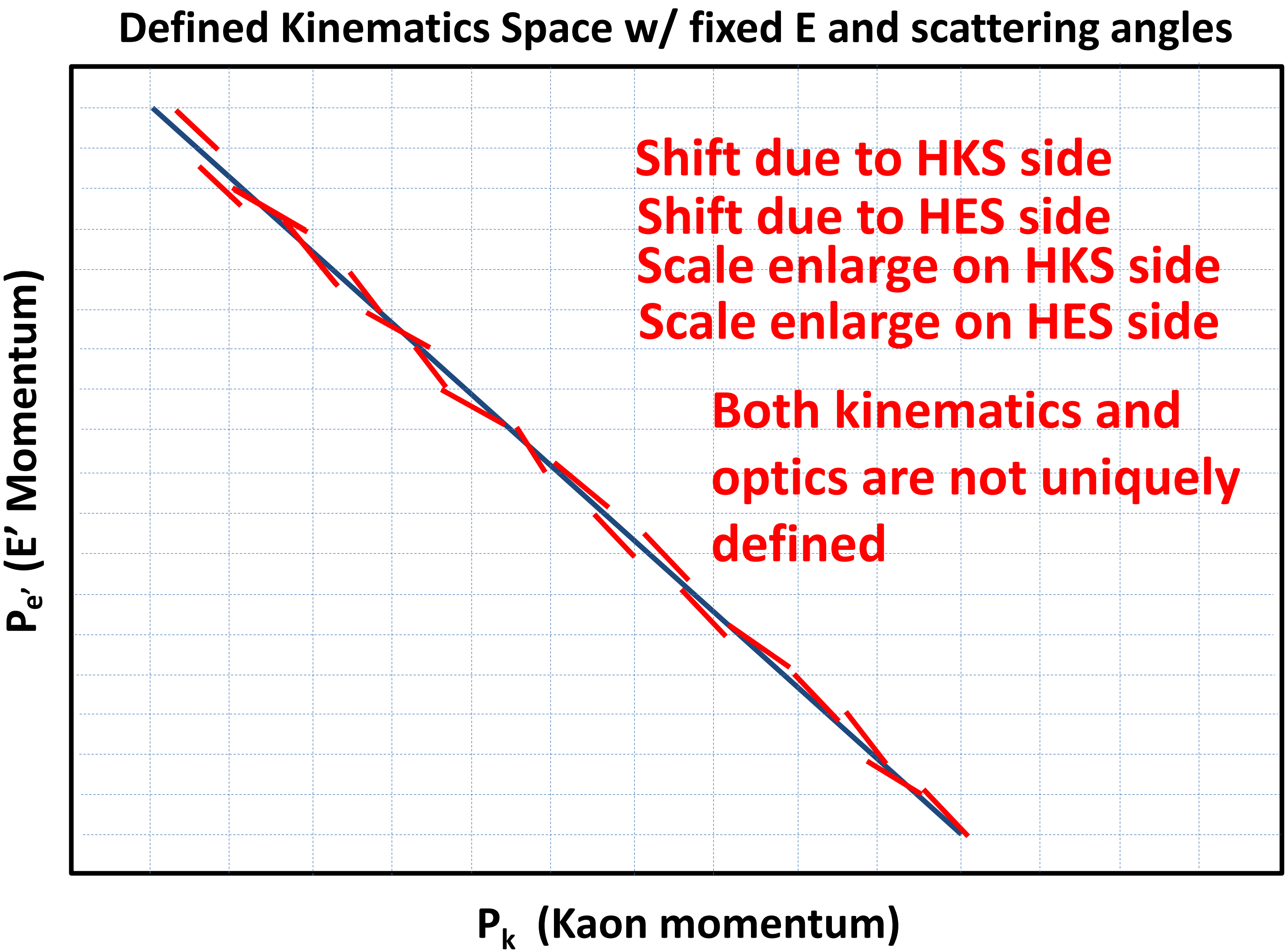
Importance of Tracking Calibration



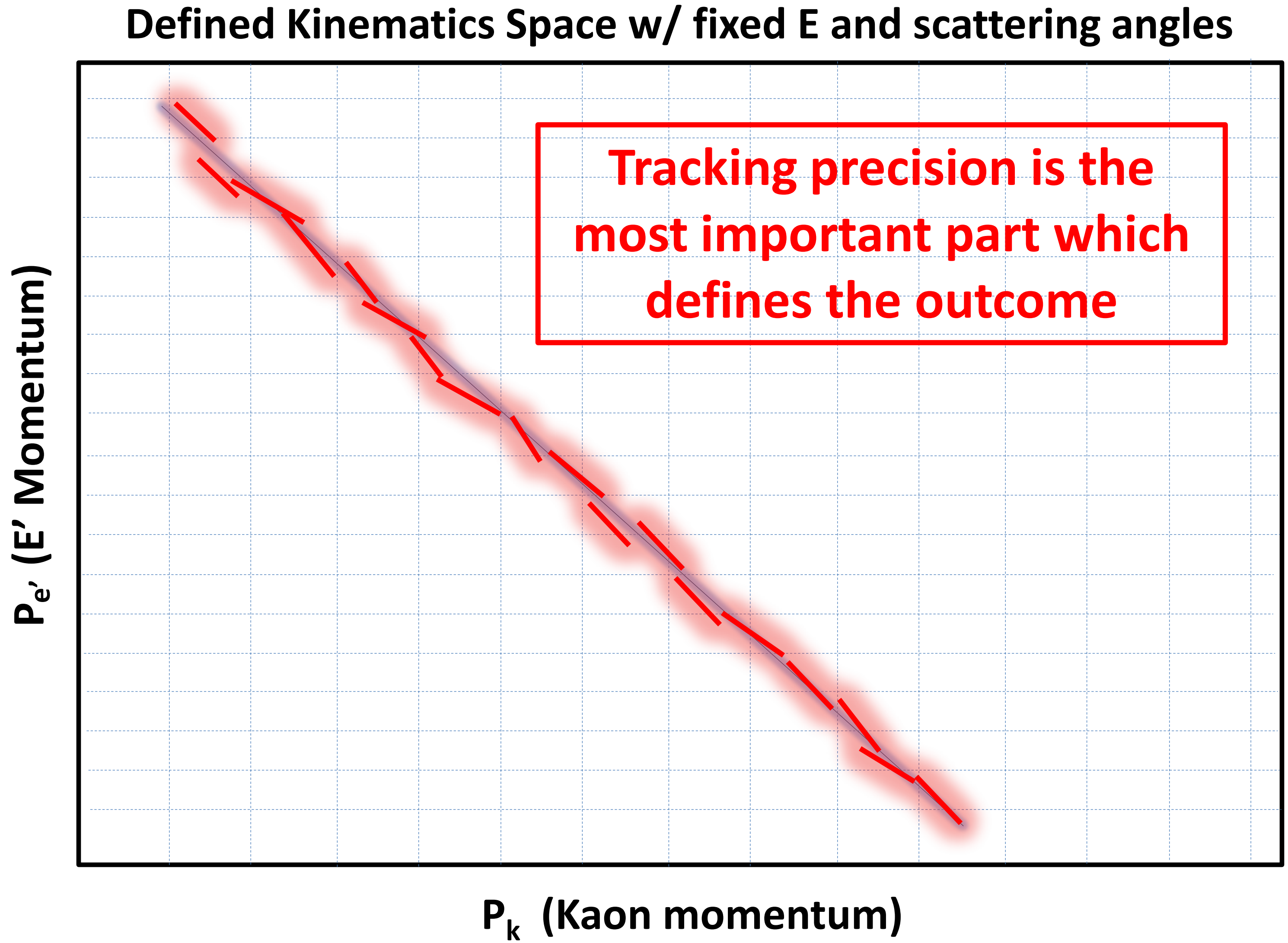
Importance of Tracking Calibration



Importance of Tracking Calibration



Importance of Tracking Calibration



Origin of Problem

- HKS is the only experiment trying to reach high precision with extremely high particle rate
- High segmentation
- High multiplicity (existing tracking code cannot ensure satisfied precision under high Multiplicity)

Source of Problems

- Alignment of start time – T_o for each chamber
  - Its resolution is not as crucial as that for KID and coin_t gate
  - It unifies the localized coordinate systems
  - It ensures the validity of one common *Drift time vs Drift Distance* calibration per plane. Otherwise, we may have to have one calibration for each group of channels defined by Amp-Disc. card.
- Error in start time for events with multiplicity larger than 1, i.e. multiple tracks and multiple hits on the *TOF* counters
- Events which have irresolvable timing (either start or stop)
- Alignment of stop time – TDC for each group defined by Amp-Disc. card

Goal of Tracking Calibration

Before we start full replay, kinematics calibration and optics optimization we must

- Align each focal plane (HKS and HES) into one single unified coordinate system within our needed precision
- Ensure scale uniformity of entire focal plane

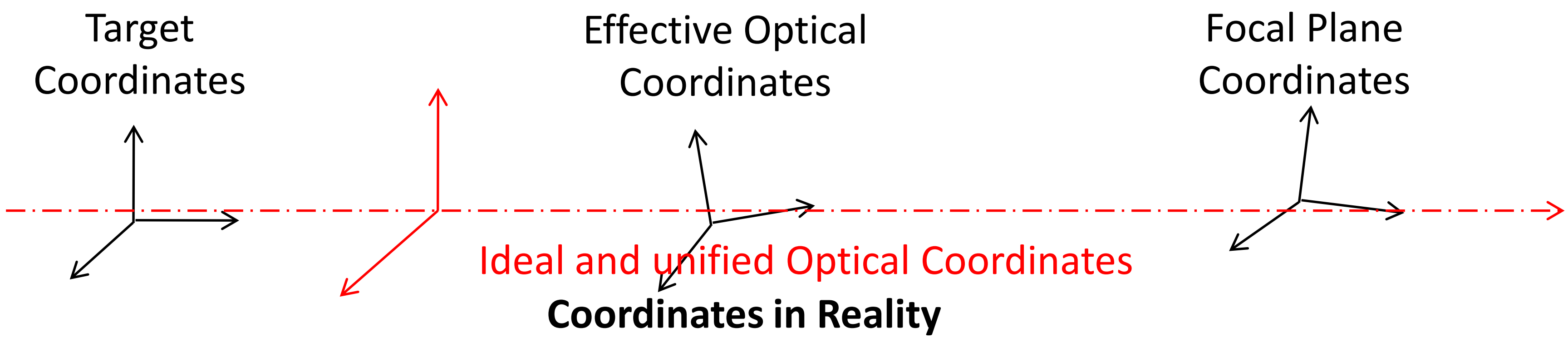
Problem may not be resolved in 100% but the goal is to keep it as small as possible, such as < few %

Kinematics Alignment

There are two important alignments:

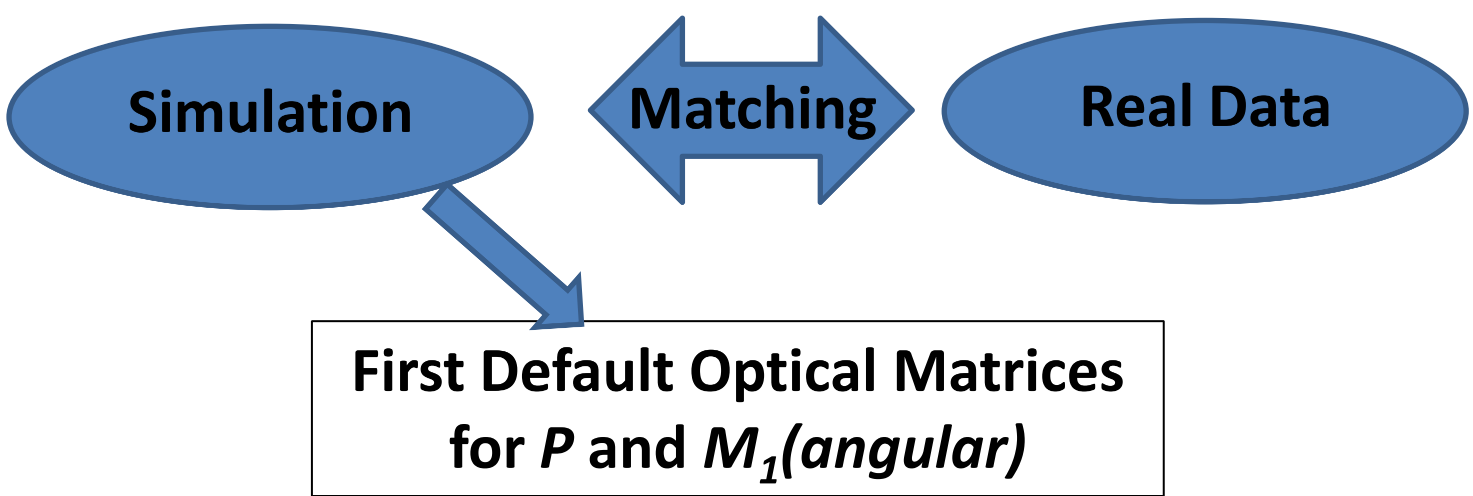
- Relative beam energy alignment
  - Apply beam energy shift correction
- Target straggling corrections to ΔE, $\Delta P_{e'}$, ΔP_k
  - Obtain (by simulation) and apply corrections for targets with well known thickness, i.e. ^{12}C, ^{7}Li, ^{9}Be, ^{10}B, and ^{52}Cr
  - Try to find $^{12}{}_{\Lambda}B_{g.s.}$ from CH_2 data and align it with that from C data by finding the corresponding target straggling for CH_2 target.
  - Find corresponding target straggling for H_2O data by aligning Λ and Σ^o with those from CH_2 target

Optical Alignment

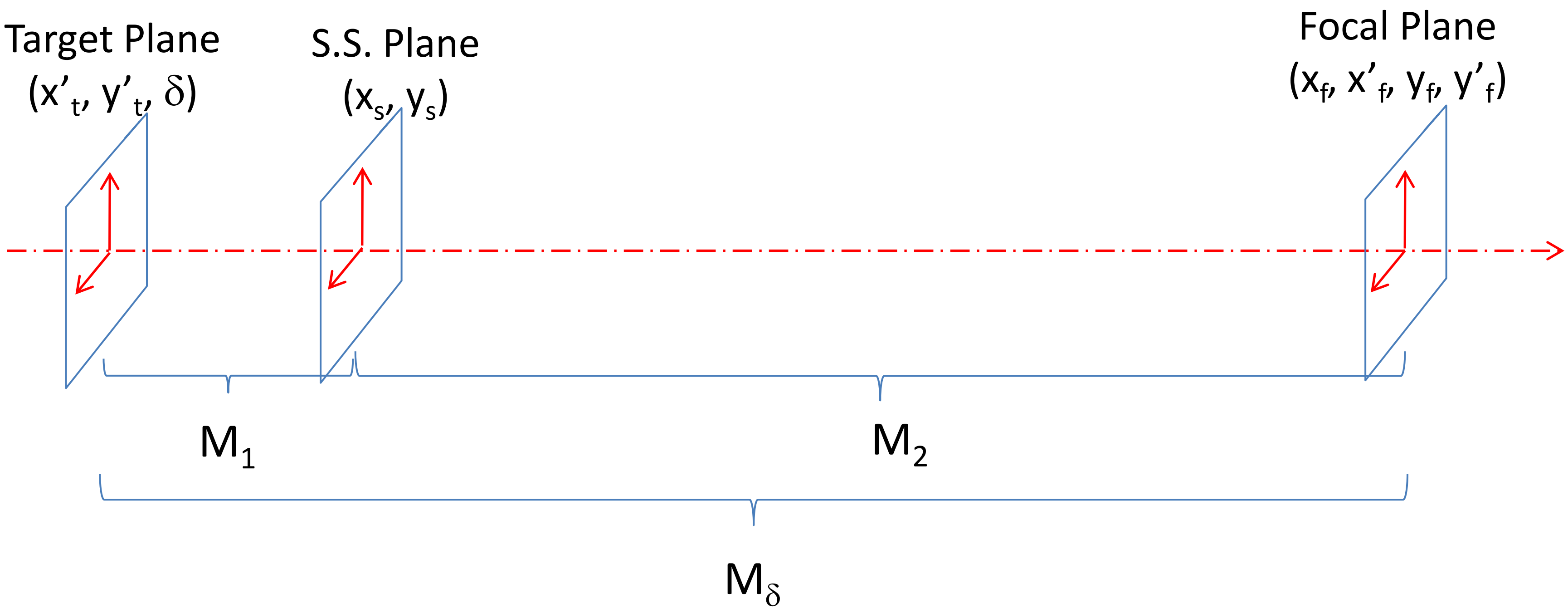


Effect to optics: symmetry and description of higher orders

What we must do before optics optimization:



Optical Matrices



- Angular matrices – two steps
  - $(x_s, y_s) = M_2\,(x_f, x'_f, y_f, y'_f)$ *Precise and one step extraction from s.s. data*
  - $(x'_t, y'_t) = M_1\,(x_s, y_s, \delta)$ *Need to be optimized w/ multiple iterations*
- Momentum matrix
  - $\delta = M_\delta\,(x_f, x'_f, y_f, y'_f)$ *Need to be optimized w/ multiple iterations*