

Optics Status Update

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Simulation Package

- Instruction:
 - Access source code: `git clone git@asymmetry.zapto.org:chao/g2psim.git`
 - Need to send me your ssh public key first
- Usage:
 - Script or executable file
 - Read instruction in the package
 - Test to be working or ifarm, require libconfig if running on a local machine
- Brief describe:
 - Almost did the same thing as SAMC, with g2p configuration and target field
 - Written with ROOT I/O embedded: good for optics study. Once optics is done, the class in the simulation package can be directly put into the replay script

Simulation Package

- Status:
 - Main structure of the simulation is done
 - I/O part based on Hall A analyzer
 - Field part uses the same algorithm as Geant4, see http://hallaweb.jlab.org/experiment/g2p/collaborators/chao/20130308/Chao_WeeklyMeeting_08032013.pdf for more details
 - Several SNAKE models included
 - Several cross section models included
 - Energy loss and multiple scattering are working by Jie (almost done)
 - SNAKE models are working by Min
 - Cross section models are from several different people (Thanks)
 - Some of them need to be test before using in our kinematics region
 - Start to use it to study optics with target field

Simulation Package

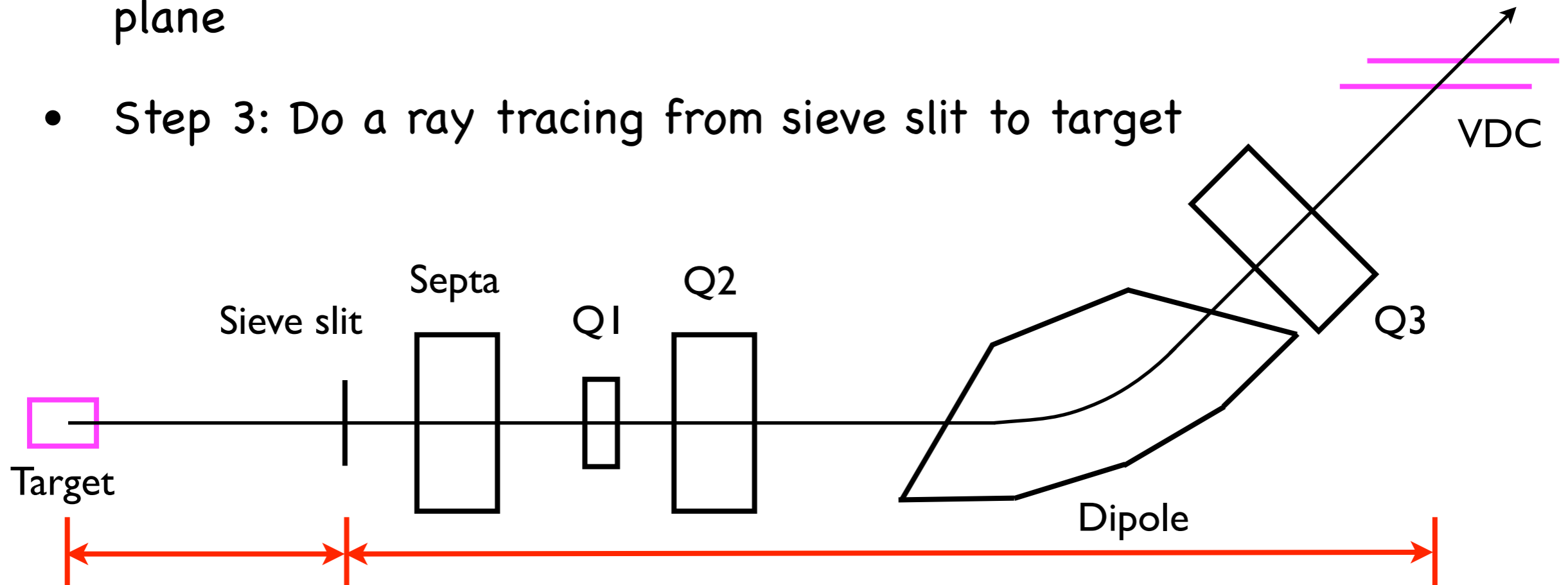
- Cross section models:
 - Elastic:
 - Form Factors from *K. C. Stansfield et al., Phys. Rev. C, 3(1971)1448*
 - ^{12}C : charge distribution from *L. S. Cardman et al., Phys. Lett. B, 91(1970)203*
 - ^1H : Form Factors from *J. Arrington, Phys. Rev. C, 69(2004)022201*
 - ^4He , ^{14}N : Moshe's code, charge and magnetization densities from *De Jager, At. Data Nucl. Data Tables, 14(1974)*
 - Inelastic:
 - QFS model, original version is described in *J. W. Lightbody et al, Computers in Physics, 2(1988)57*
 - P. Bosted's Fits, the fitting result is described in *P. E. Bosted et al, Phys. Rev. C, 78(2008)015202* and *arXiv:1203.2262*
 - Radiative correction for QFS from K. Slifer's E94010 technical note
- Work as a standalone package, you could use it without the support of the simulation package

Optics Status

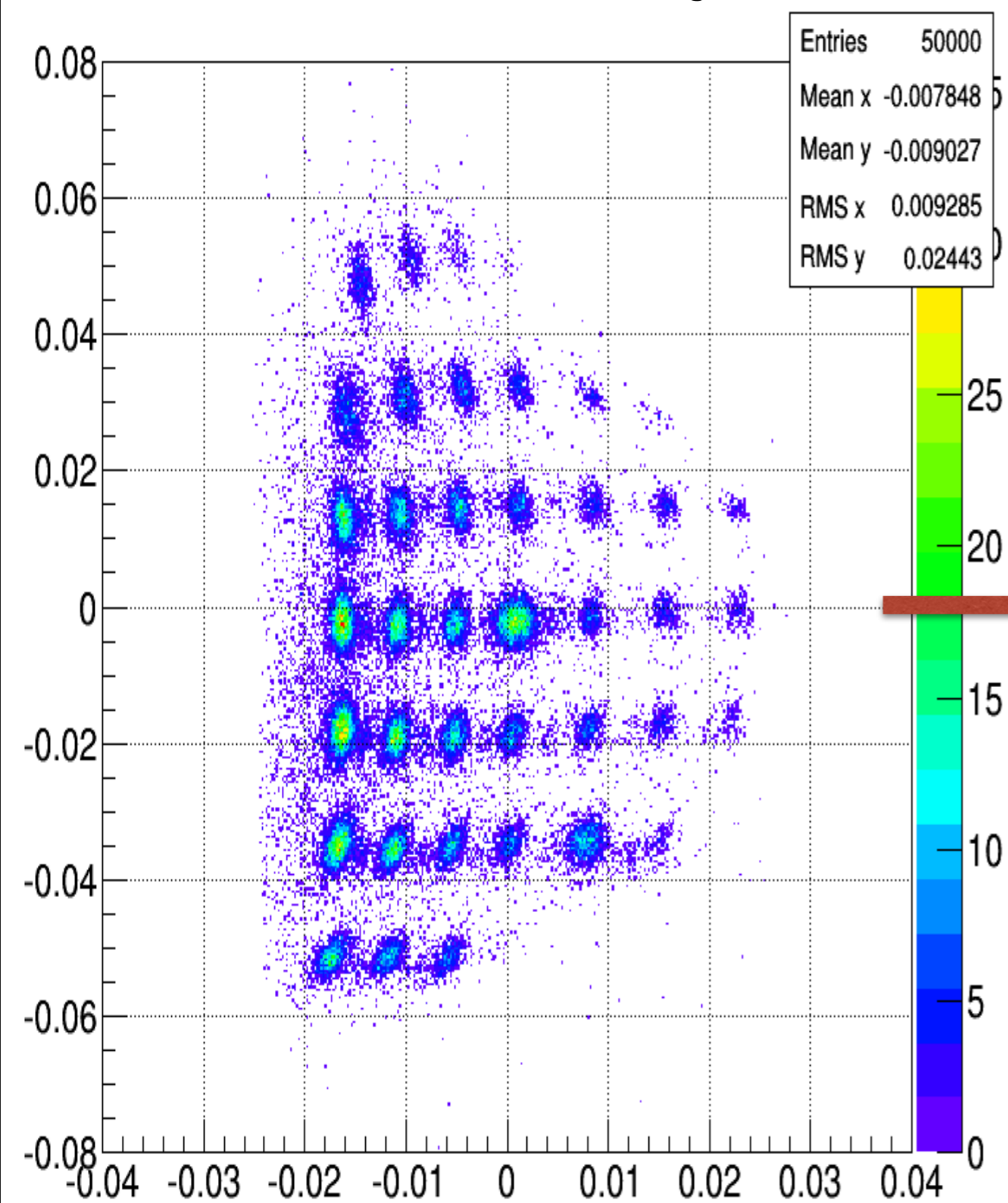
- With target field
- Start with the “best” setting:
 - Beam energy 2.253GeV
 - Target field 2.5T
 - 48-48-16 Septum magnet

Optics with Target Field

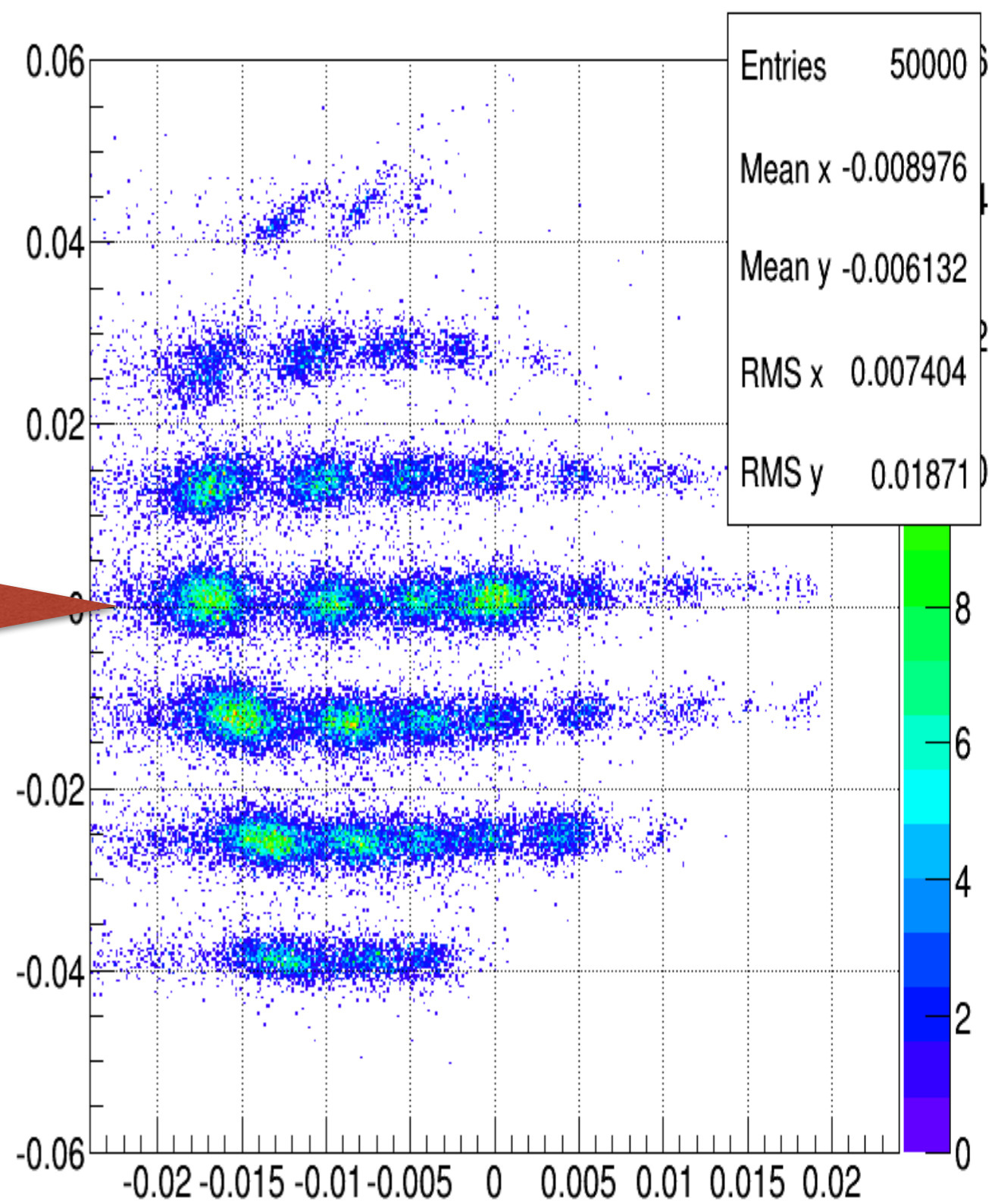
- Method
 - Step 1: Use straight through matrix reconstruct to target plane
 - Step 2: Project from target plane to sieve slit
 - Step 1 + 2 reconstruct from focus plane to sieve slit plane
 - Step 3: Do a ray tracing from sieve slit to target



Matrix reconstruct to Target Plane



Project to Sieve Slit

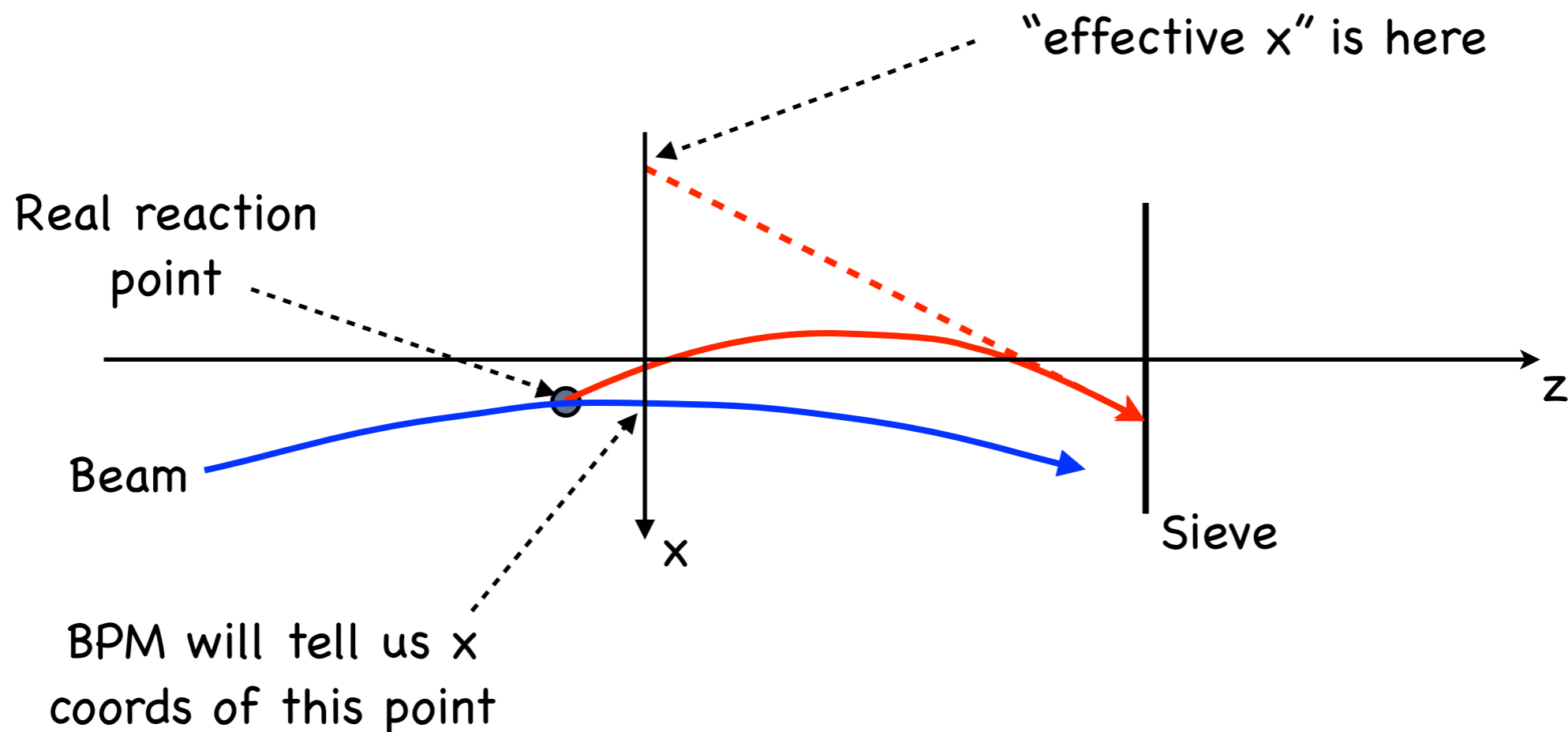


Optics Status

- Possible reason:
 - Sieve slit is projected from target plane with the reconstructed angle and the beam position
 - Reconstructed angle looks reasonable
 - Beam position:
 - y is reconstructed from the focus plane variable
 - x has no reconstruction, using "effective x'' "

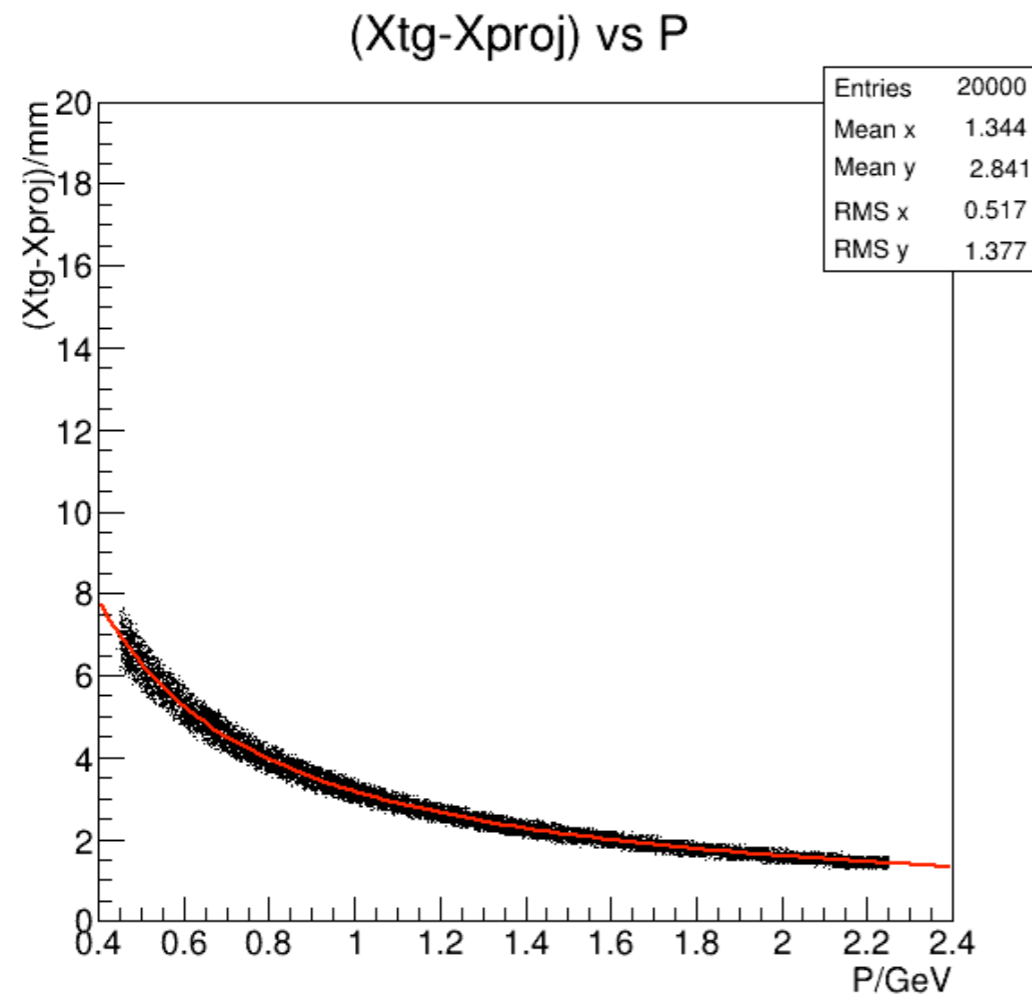
Reconstruction with target field

- Matrix reconstruction does not have x information
- However, we can not directly use BPM x
- With target field, we need to calculate a effective x at target plane as the start point of the projection
- We fit the effective x vs BPM x with simulation, still testing if it works with real data

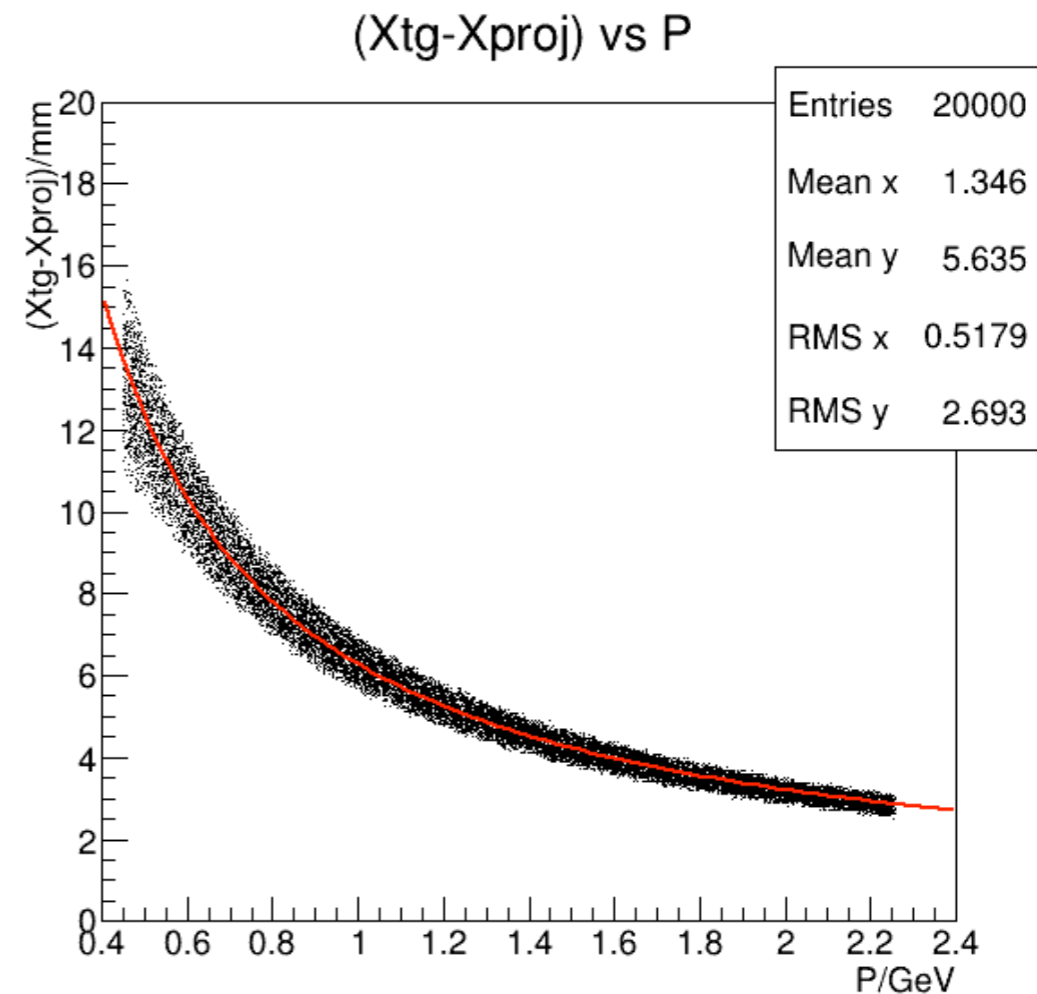


Reconstruction with target field

- The relations between x_{tg} and x_{proj}
- Only the drifting in target field process will influence the relations between these 2 variables
- Drifting a particle in the field only dependent on the momentum of the particle



$$2.5T, \gamma=0.018+3.149/x$$



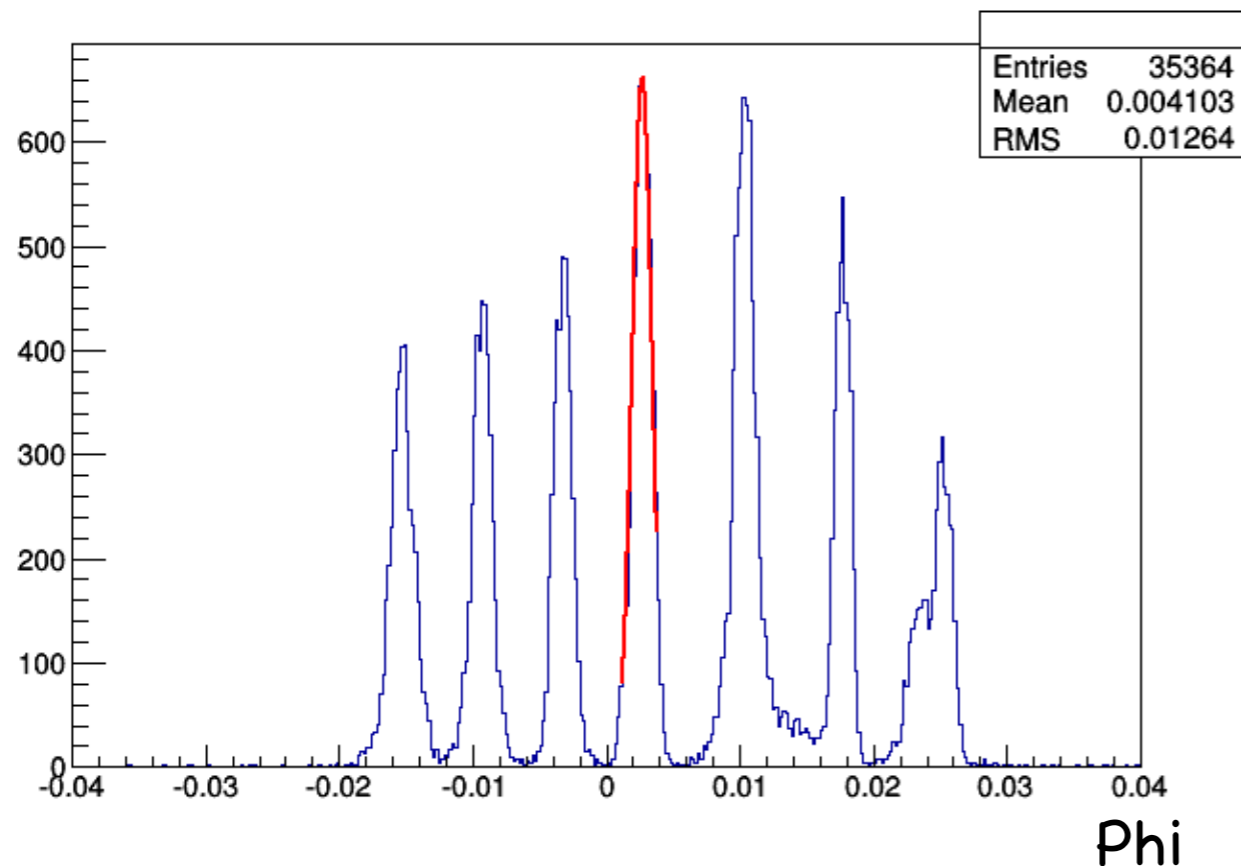
$$5.0T, \gamma=0.141+6.128/x$$

Backups

Simulation Package

- Know issue: difference on phi
- See Min's talk for more detail
- Check with the most recent matrix and the most recent simulation package (which cleaned several bugs), it looks better now
- Maybe Min could do more check

Simulation, mean= $2.71e-3$



Data, mean= $2.59e-3$

