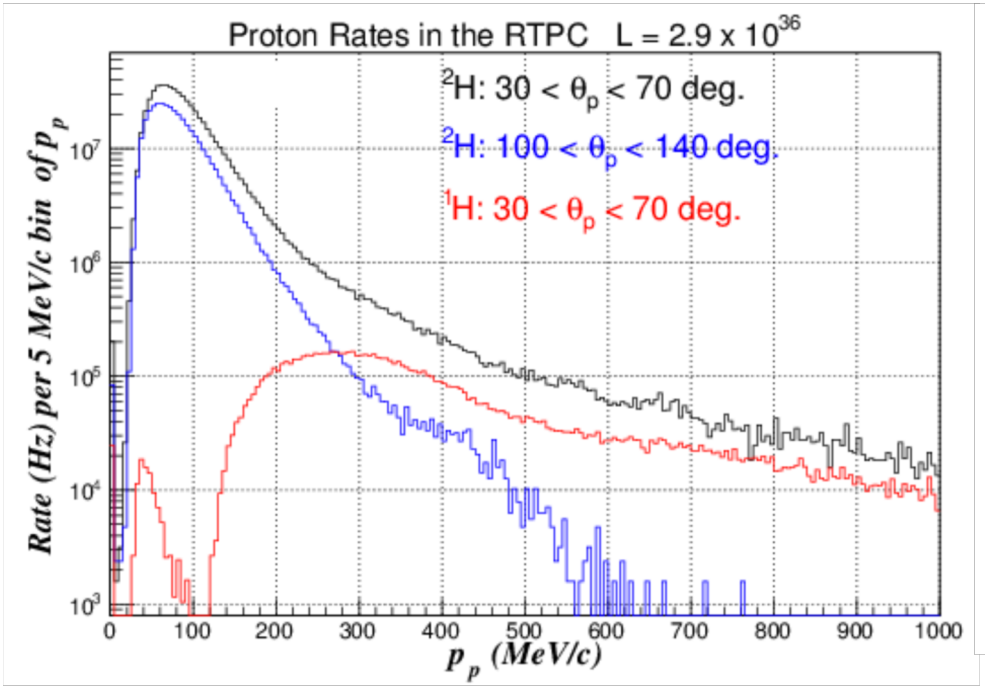
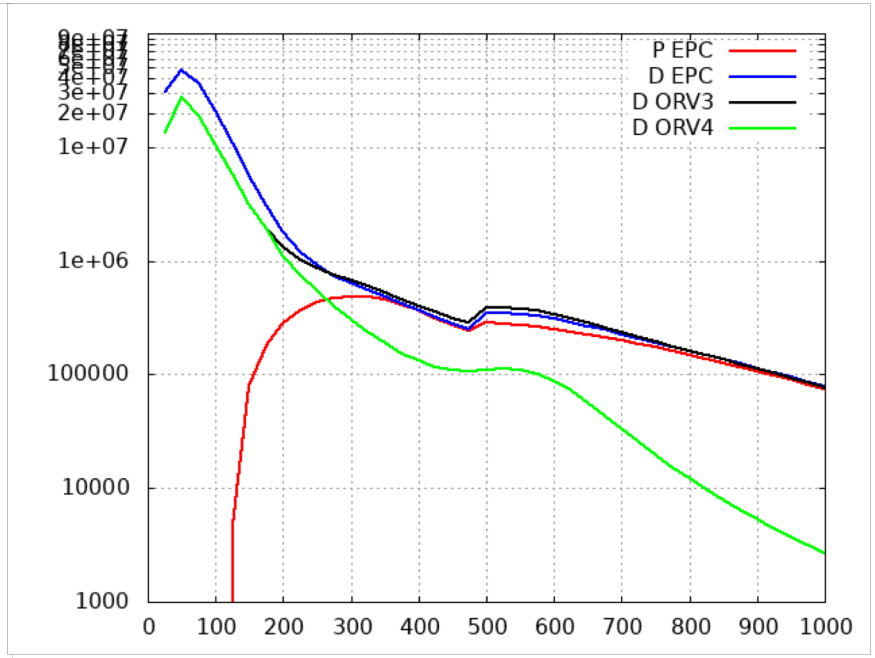
TDIS Proton Singles Rates

Rate / 5 MeV - Proposal



Rate / 5 MeV – Various EPC versions. $30^\circ < \theta_p < 70^\circ$



Original EPC

Oscar Rondon V3

Oscar Rondon V4

TDIS Proton Accidentals – deuteron target

Integrate rates over
30—70° , 70-400 MeV/c

Rates assume:
60 μA
40 cm LD2 @ 0.64×10^{-3} g/cm²
LH2 @ 0.32×10^{-3} g/cm²

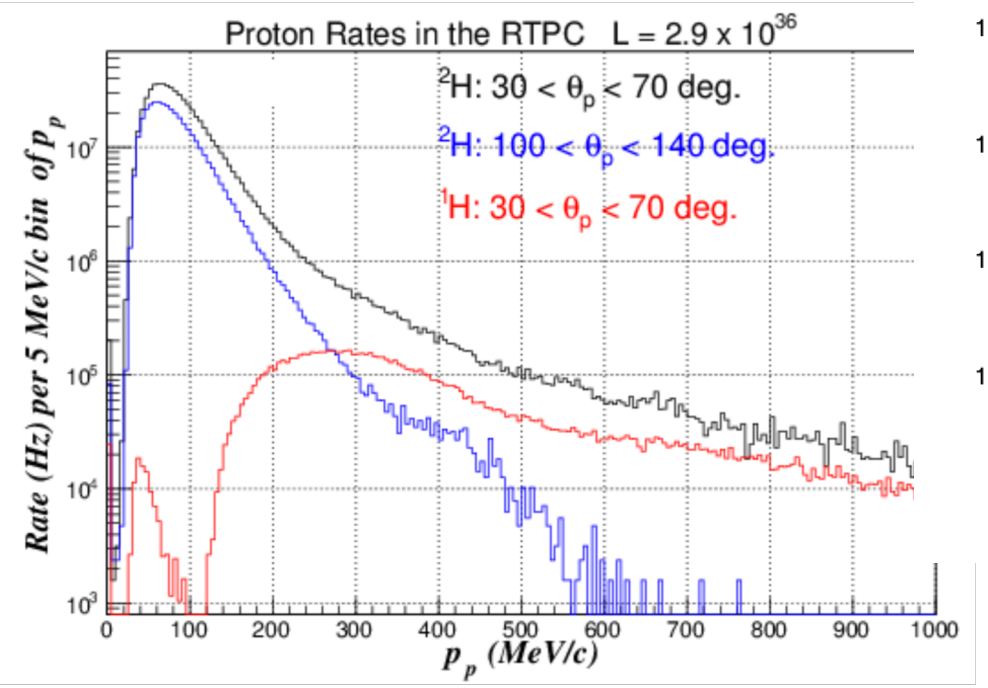
Calculate probability of detecting accidental electron indistinguishable from signal.

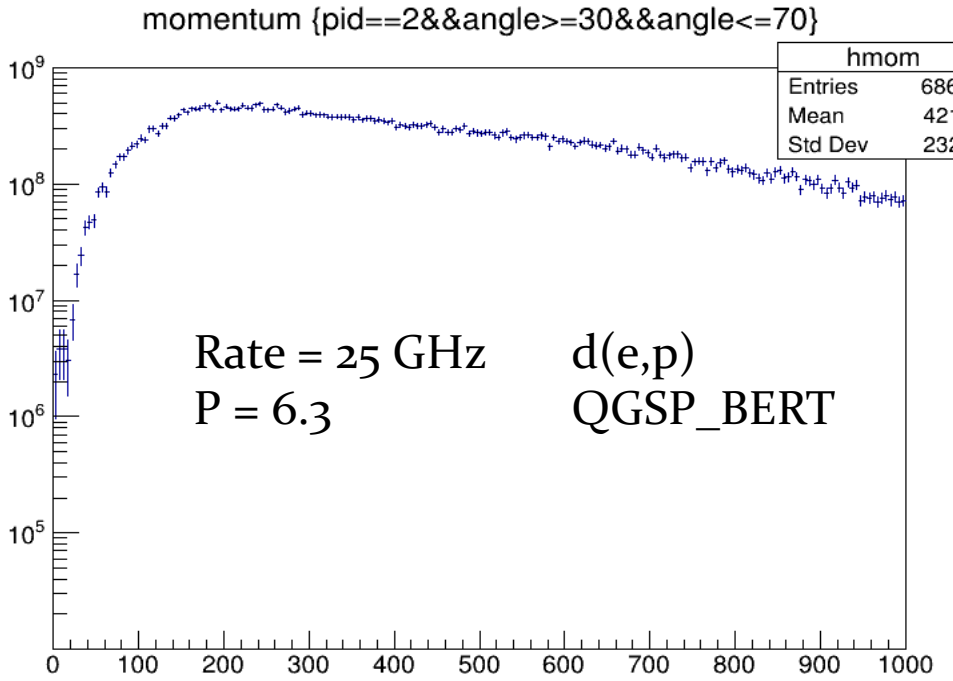
P = Rate × Δt × Δz/40 cm
T = 10 ns, z = 1 cm

EPC Version	σ	Rate	Probability
original	70 μb	403 MhZ	0.10
OR V3	65 μb	378 MhZ	0.09
OR V4	123 μb	712 MhZ	0.18

Probability to be compared to probability per detected electron to have a "signal" proton.
Probabilities assume perfect rejection of protons not in 30-70, 70-400 acceptance.

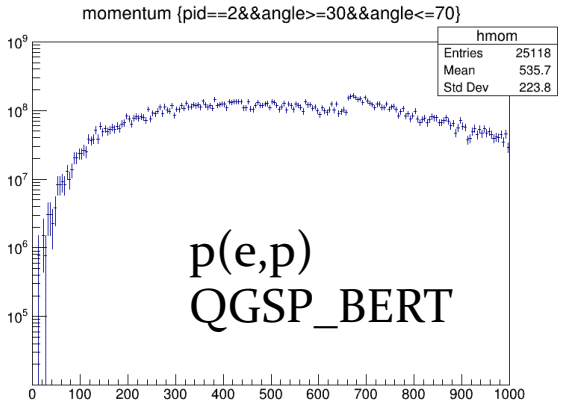
TDIS Proton Singles Rates from geant4/QGSP_BERT





For proton Rate = 5.2 GHz, P=1.3

No particular reason to believe geant4, but why is it so bad?



Validating/Updating EPC

How well is EPC validated in our range?

Can we confirm that hydrogen target singles are much less than deuterium target singles?

Are singles rates available from BONUS?

Can we use Gluex p(γ,p) data. P>= 300 MeV/c should be available.

Random tracks – start time of track unknown. This means there is an unknown z offset of points on track.

We get some handle on z by disappearance of track when it hits a plane.

But can we really beat down accidentals with BOTH timing and vertex position relative to electron? Implies ΔT ~ 50 ns?

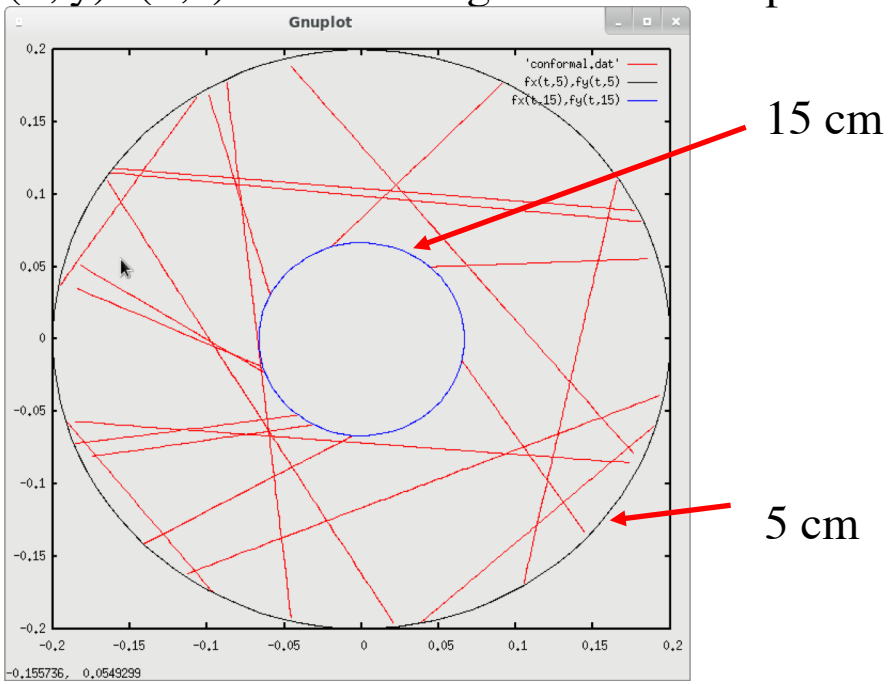
Tracking – Conformal Mapping

From ACAT 2019 (Anvanced Comput and Anaysis Techniques)

ConformalTracking - geometry agnostic tracking library

For hits (x,y), apply mapping: $u=x/(x^2+y^2)$, $v=y/(x^2+y^2)$

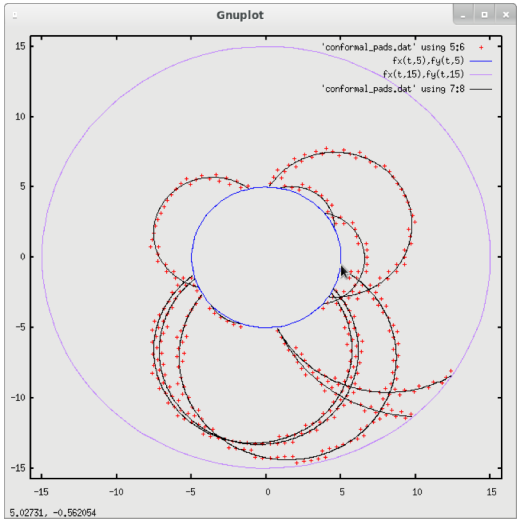
Circles passing through (x, y)=(0,0) will be straight lines in u/v plane

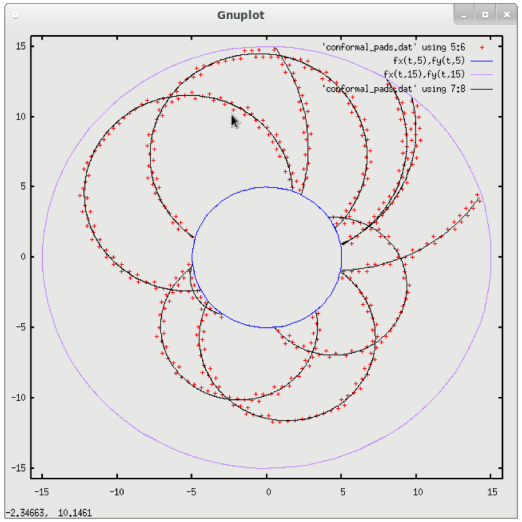


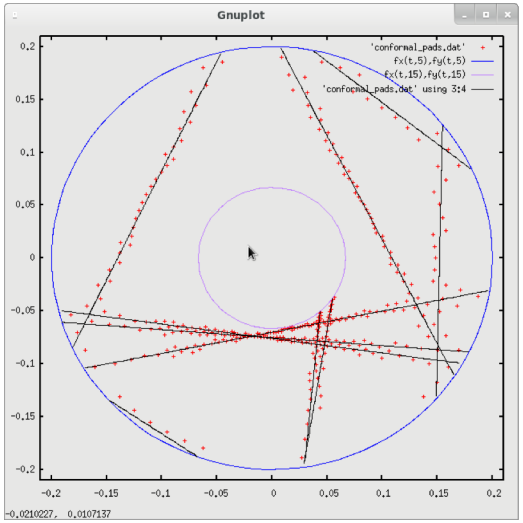
15 cm

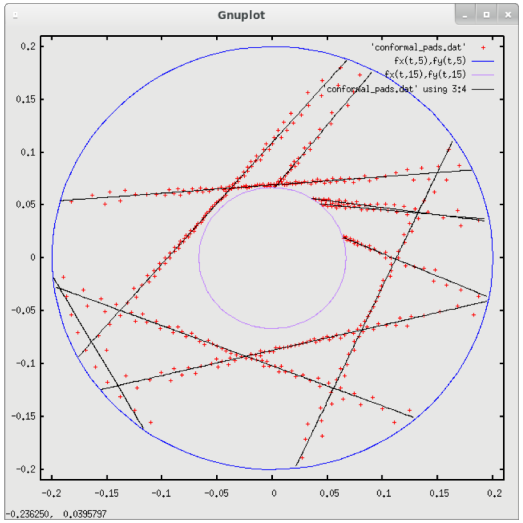
5 cm

Tracking – Conformal Mapping









Circles “digitized” to pad centroids. (Assume uniform area pads.)

Smaller area pads near target would be desirable.

How straight will lines look with energy loss. (Is small quadratic term sufficient.)

Next step, plot simulation tracks.