

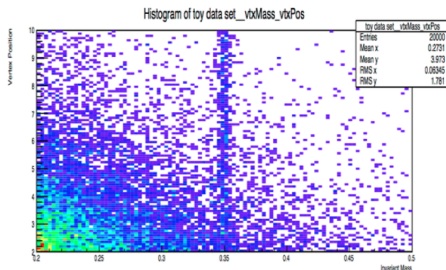
Initial Plans for the A' Vertex Search

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The search

- Event sample: e^+e^- pairs with 2-track vertex and invariant mass
 - ▶ Event quality cuts, blinding
- Signal: small number of events with detached vertices and a single mass
 - ▶ Parameters: mass, production cross-section, lifetime
 - ▶ In minimal model, cross-section and lifetime are both determined by α'/α
- Background: QED tridents with finite vertex resolution and smooth mass distribution



Event cuts

- Many cuts are common to all analyses:
 - ▶ Calibration, data quality: not relevant for MDC
 - ▶ Track quality (track fit and time χ^2 , ECal track match)
 - ▶ Pair quality: (vertex fit χ^2 , $E_+ + E_- \approx E_{beam}$)
 - ▶ Kinematic cuts to be developed
- Important to reduce vertex tails (may or may not be useful for other analyses):
 - ▶ Track quality: layer 1 isolation cut (mishits), kink cut (large-angle multiple scattering)

Blinding

- Hidden signal box: cut out events with vertex Z above some limit
 - ▶ Box should be looser than expected signal region, but tight enough that background can be characterized before unblinding
- Before unblinding:
 - ▶ Measure vertex resolution as a function of mass, compare to expected value
 - ▶ Measure trident rate as a function of mass, compare to MC

Fitting the signal

- Use a mass window larger than mass resolution (to capture all signal events), but small enough that background (i.e. trident rate and vertex resolution as function of mass) can be fit well; step the window across the search range
- At each step, do a (probably unbinned) fit to the cross section and lifetime, either as independent parameters or both dependent on α'/α
 - ▶ Cross section computed from signal event count using relationship to radiative trident cross section
 - ▶ Get a limit on α'/α