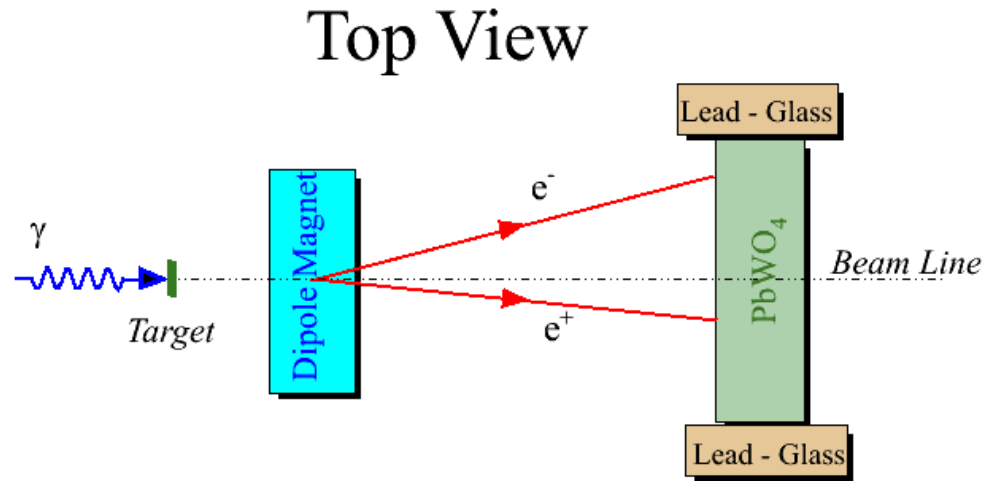


Status of (Single Arm) Pair Production Cross Section at PrimEx

**Aram Teymurazyan
University of Kentucky**

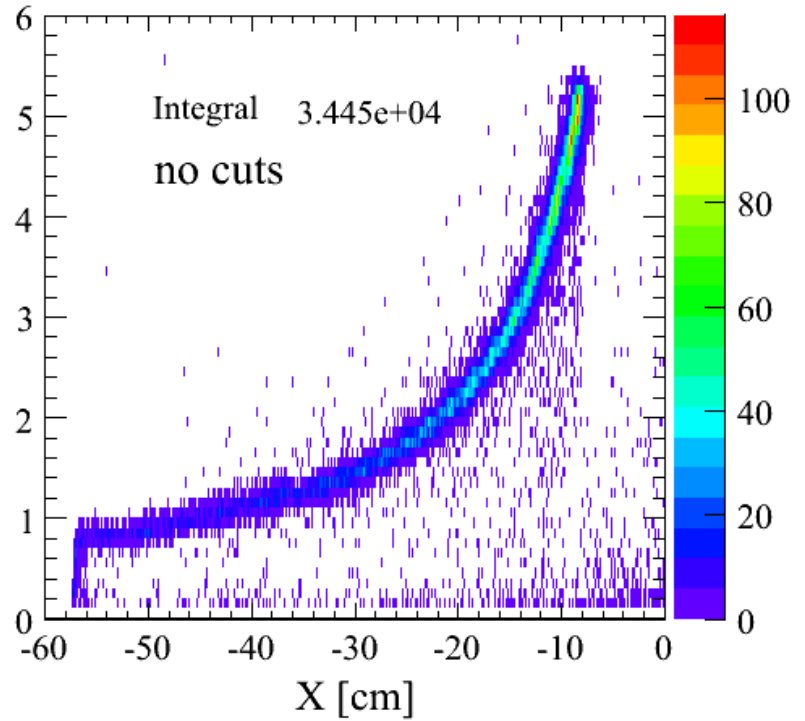
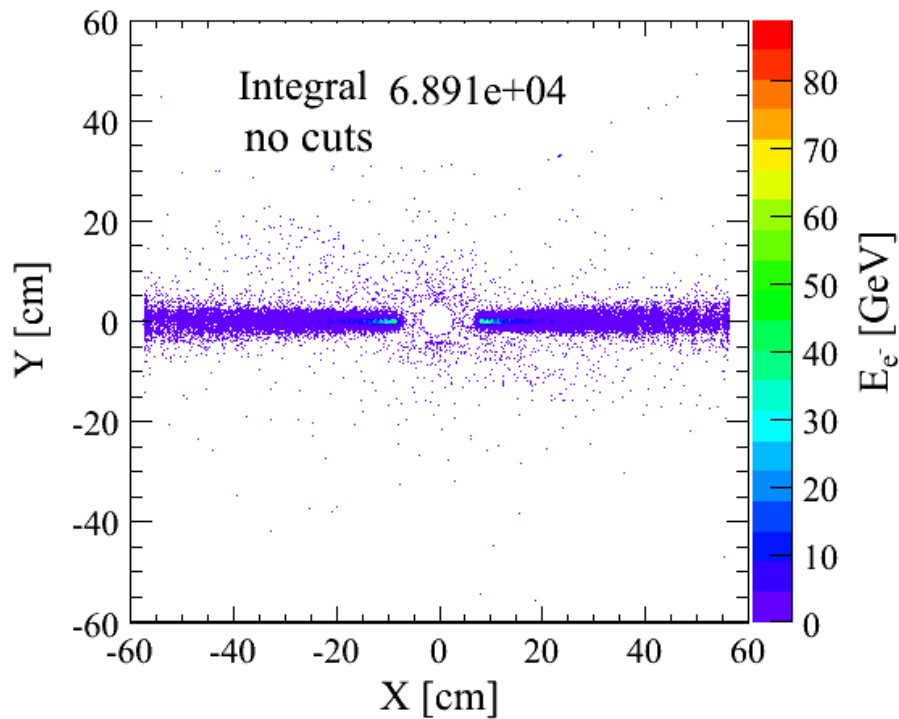
PrimEx Jun 21, 2007

Pair Production in PrimEx



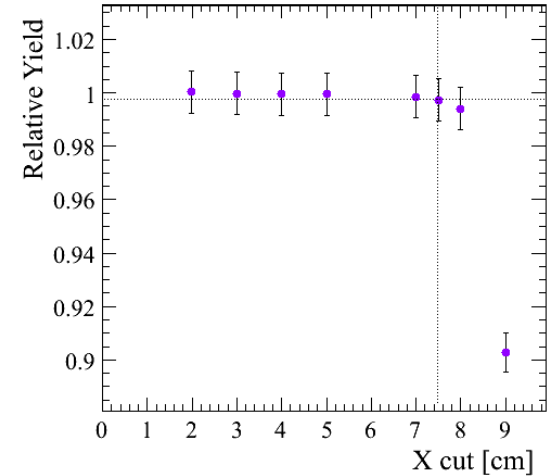
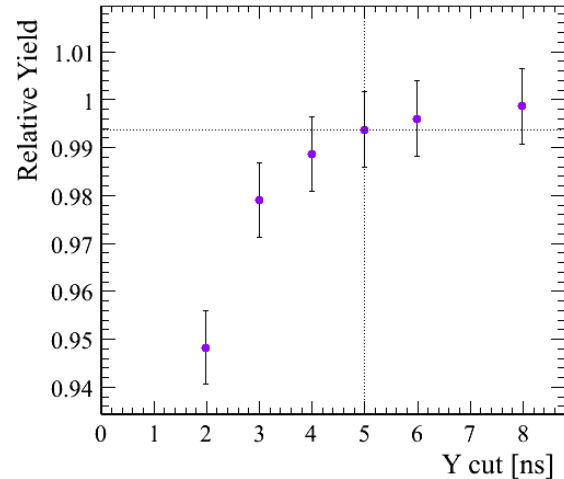
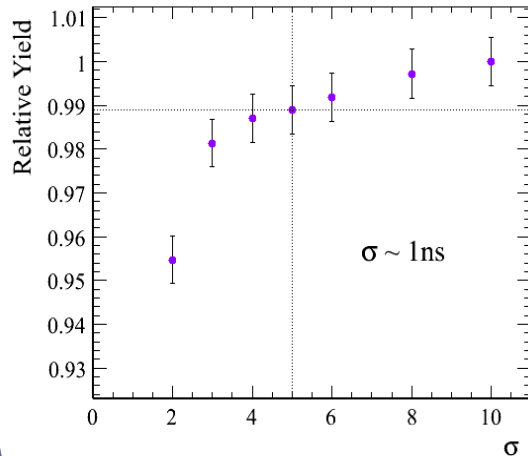
- Measured Quantities
 - Energy of the incident photon
 - Energy of each lepton
 - Position of each lepton
- Event Selection
 - Timing cut
 - Fiducial cut

Pair Production Events

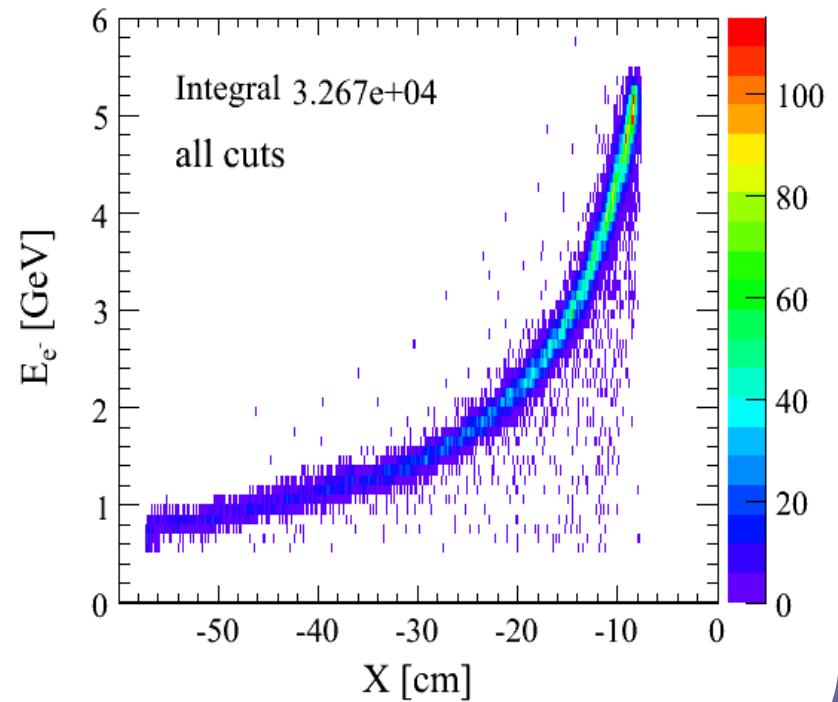
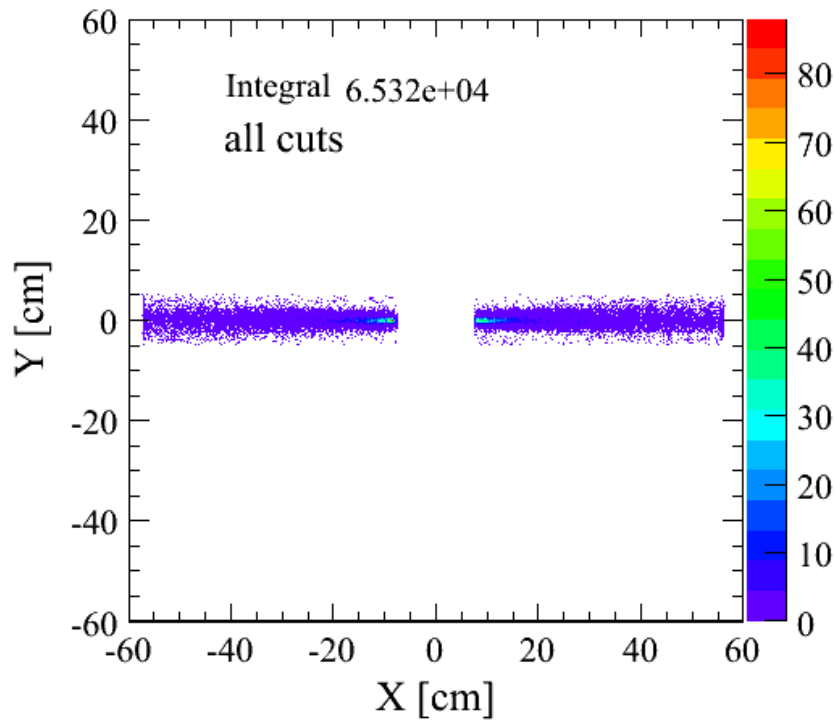


Applied Cuts

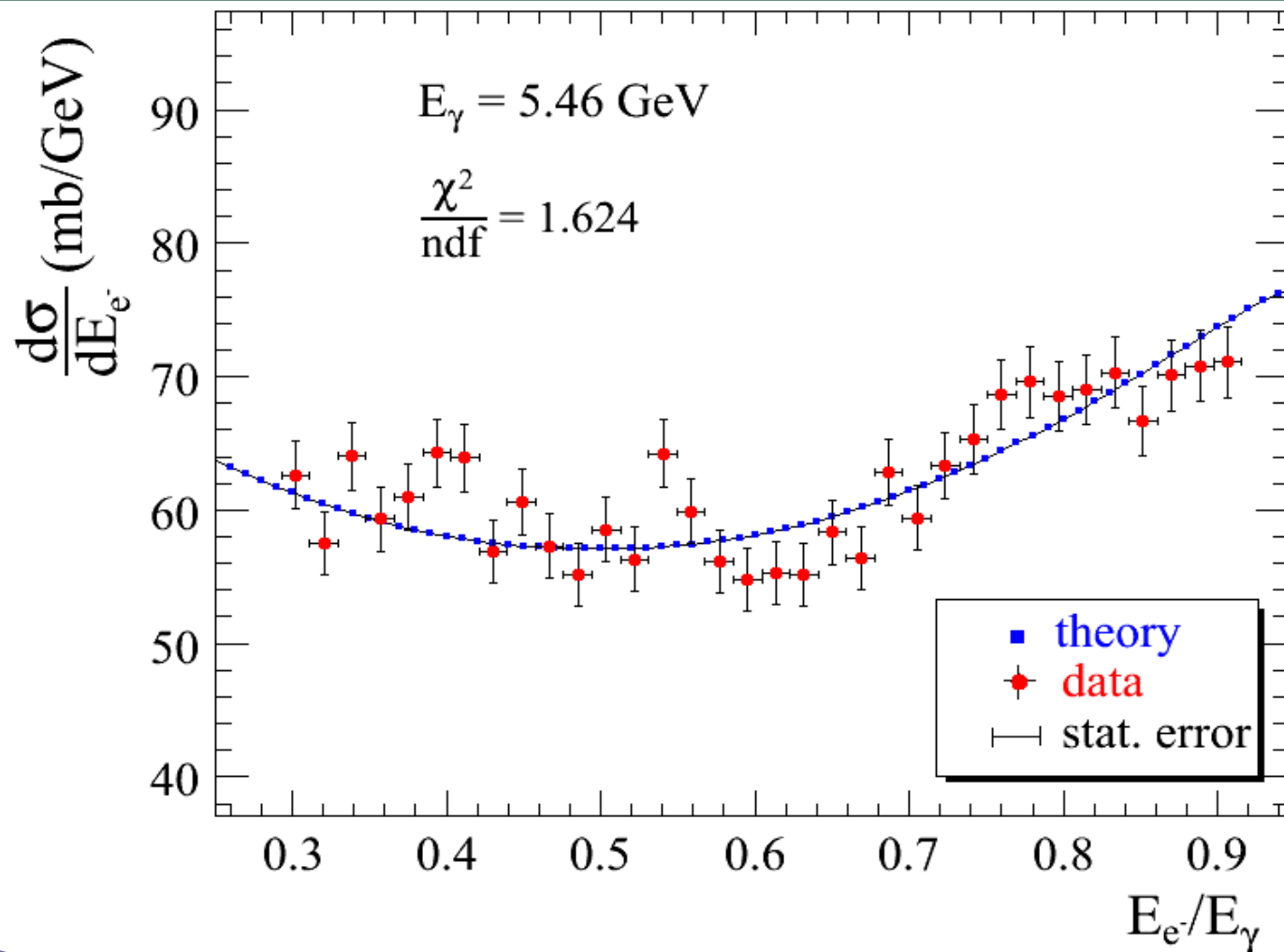
- $\pm 5\sigma$ timing cut ($\sigma \sim 1$ ns)
- $|X_{1,2}| > 7.5$ cm $|Y_{1,2}| < 5$ cm



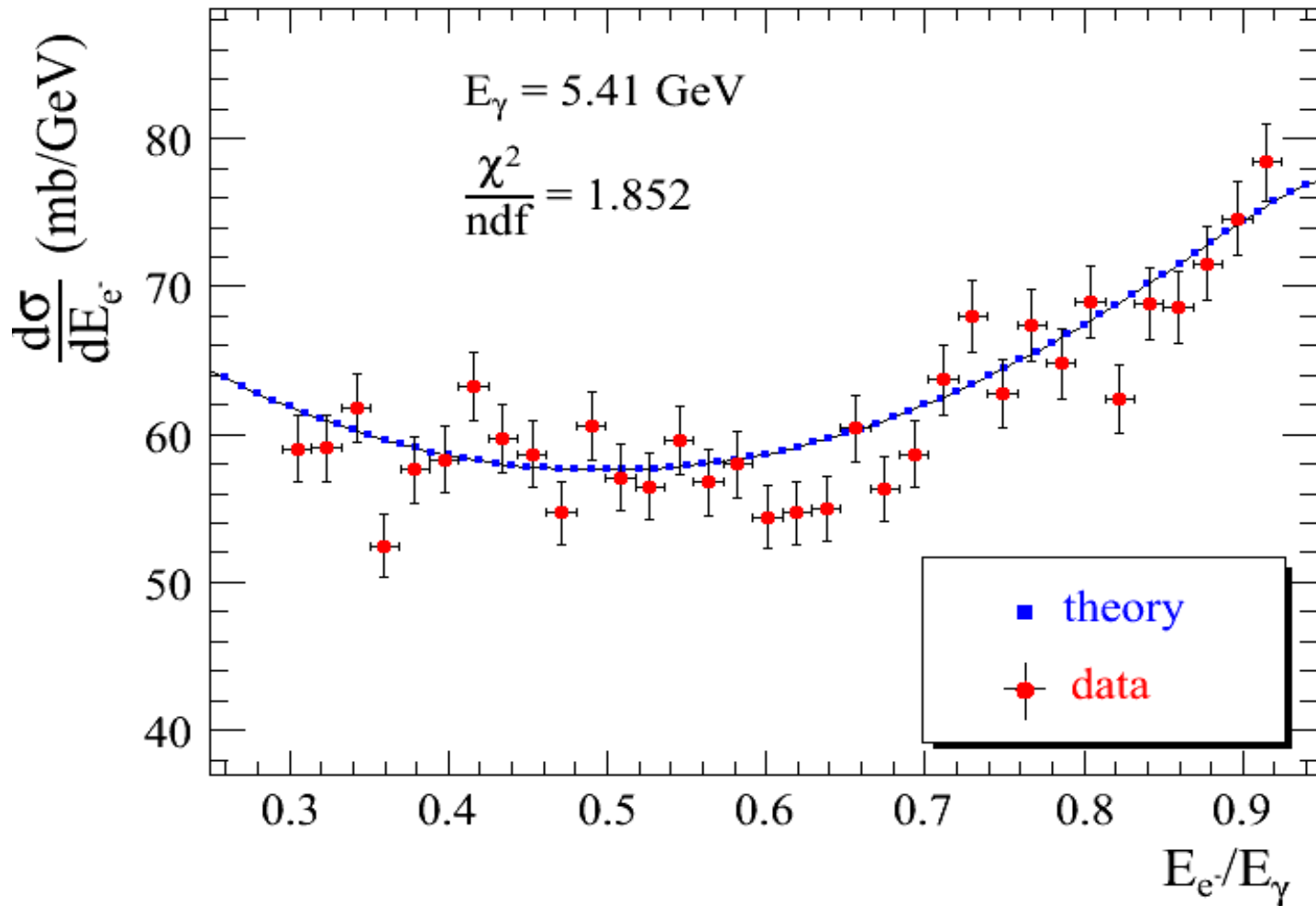
Pair Production Events



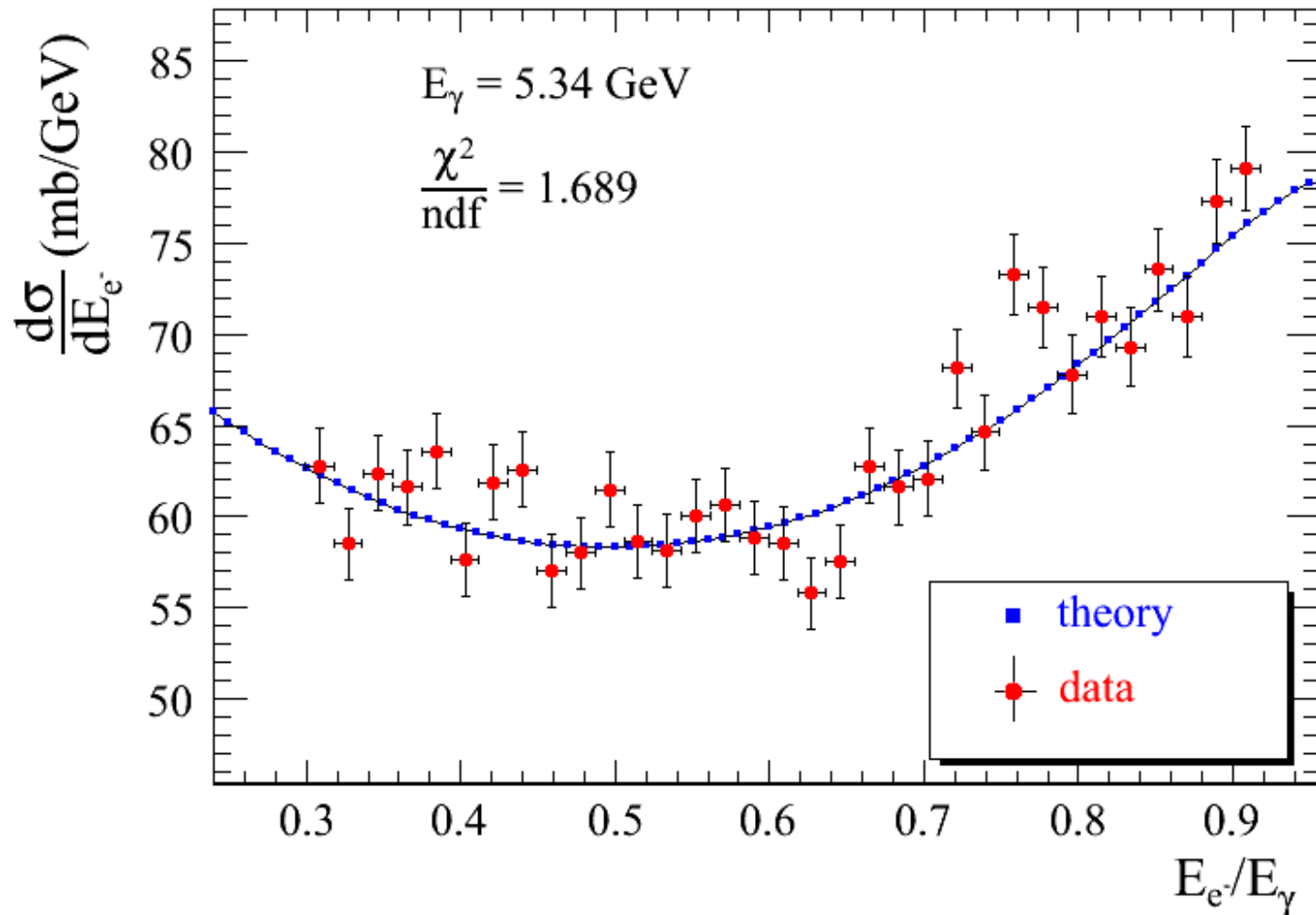
Experimental Results



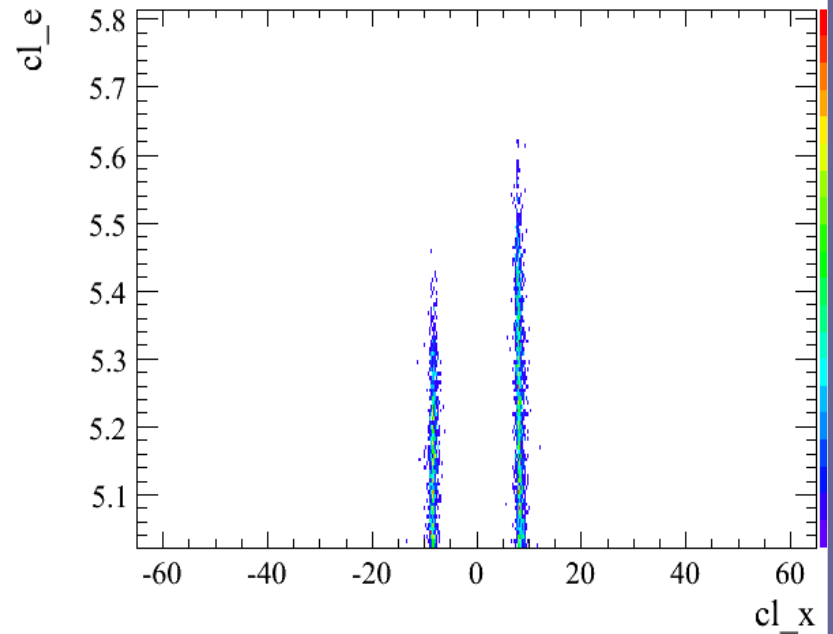
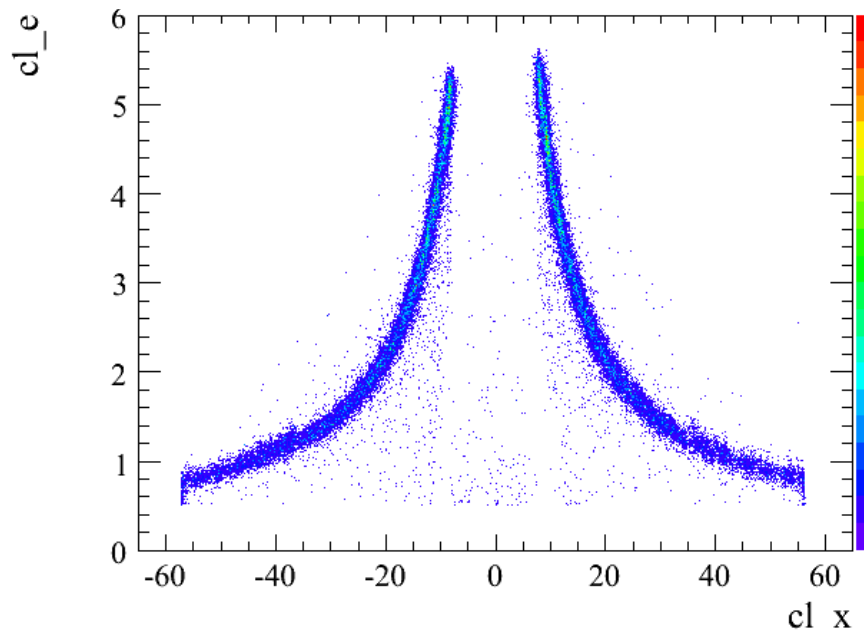
Experimental Results



Experimental Results



Experimental Results

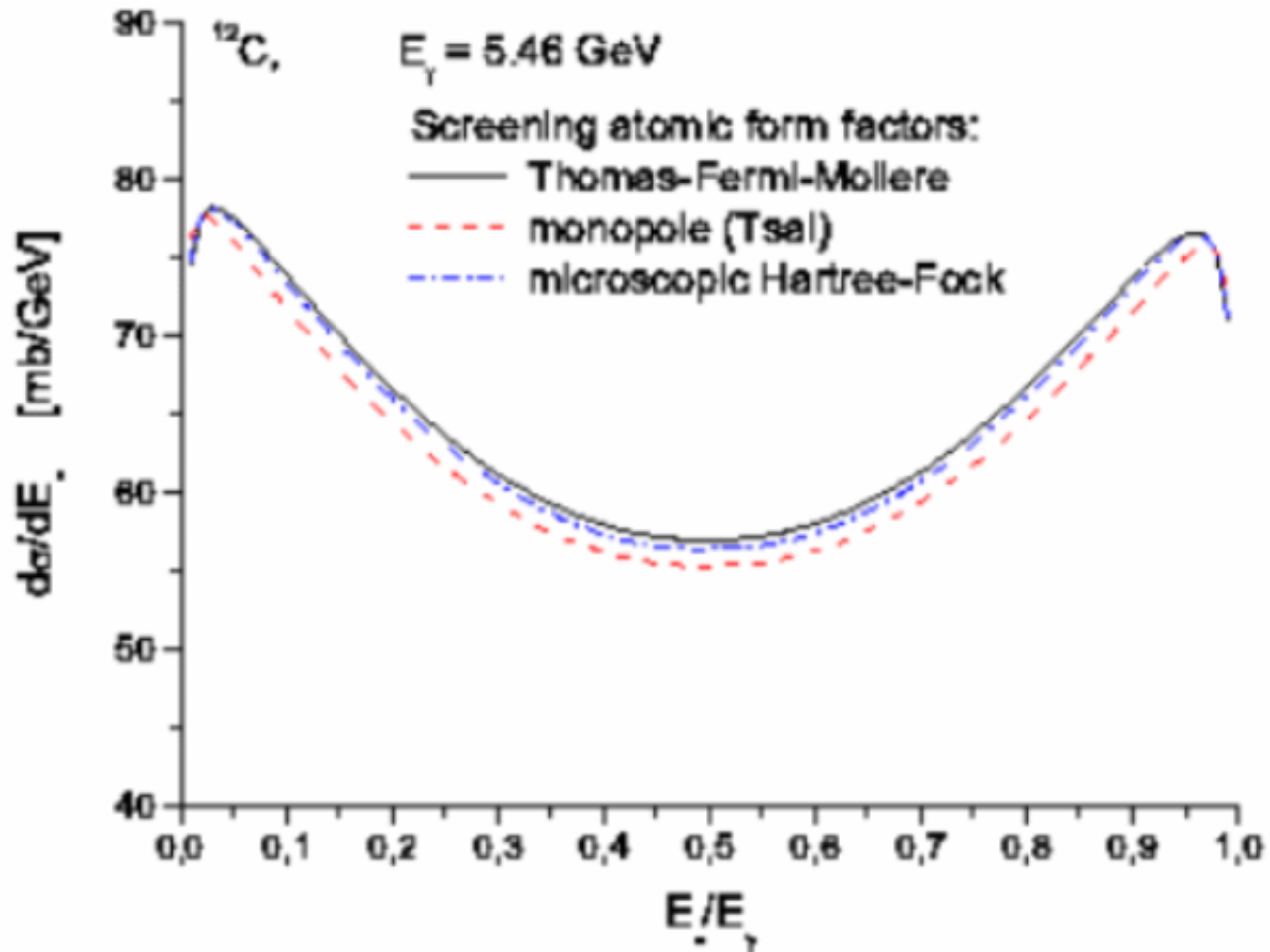


State of the Art Calculation of e^+e^- Cross-Section for PrimEx Kinematics

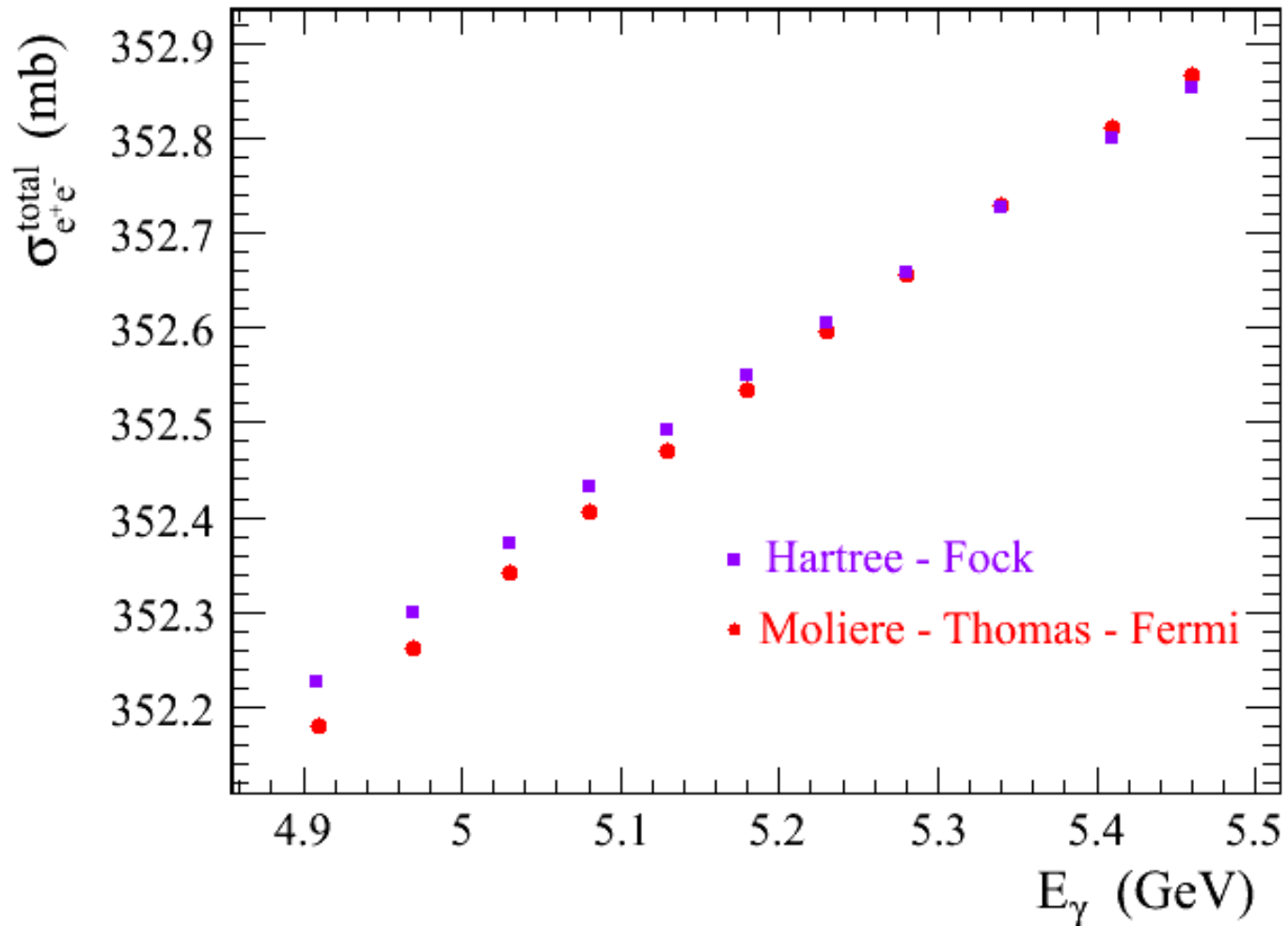
Calculations by Alexandr Korchyn:

- Bethe-Heitler mechanism of pair production on the nucleus with screening effects due to atomic electrons and Coulomb distortion
- Pair production off atomic electrons, considering excitation of all atomic states and correlation effects due to presence of other electrons and the nucleus
- Radiative corrections (of order α/π) (i) virtual-photon loops and (ii) real-photon process like $\gamma + A \rightarrow e^+ + e^- + A + \gamma$
- Nuclear incoherent contribution, $\gamma + p \rightarrow e^+ + e^- + p$
- Nuclear coherent contribution (VCS), $\gamma + A \rightarrow \gamma^* + A \rightarrow e^+ + e^- + A$

Theoretical Calculation



Theoretical Calculation



Summary

- Agreement with theory at the level $\sim 2.5\%$ (electron arm)
- A simulation is needed

Systematic Error (OVER) Estimation

Photon Flux	2.5%
Target Thickness	0.053%
Background Estimation	0.5%
Calibrations	2.8%
Total	$\sim 3.8\%$