Lab activities @LNF

Status Report

A. Calcaterra, R. de Sangro, G. Felici,
G. Finocchiaro, P. Patteri, M. Piccolo
INFN LNF

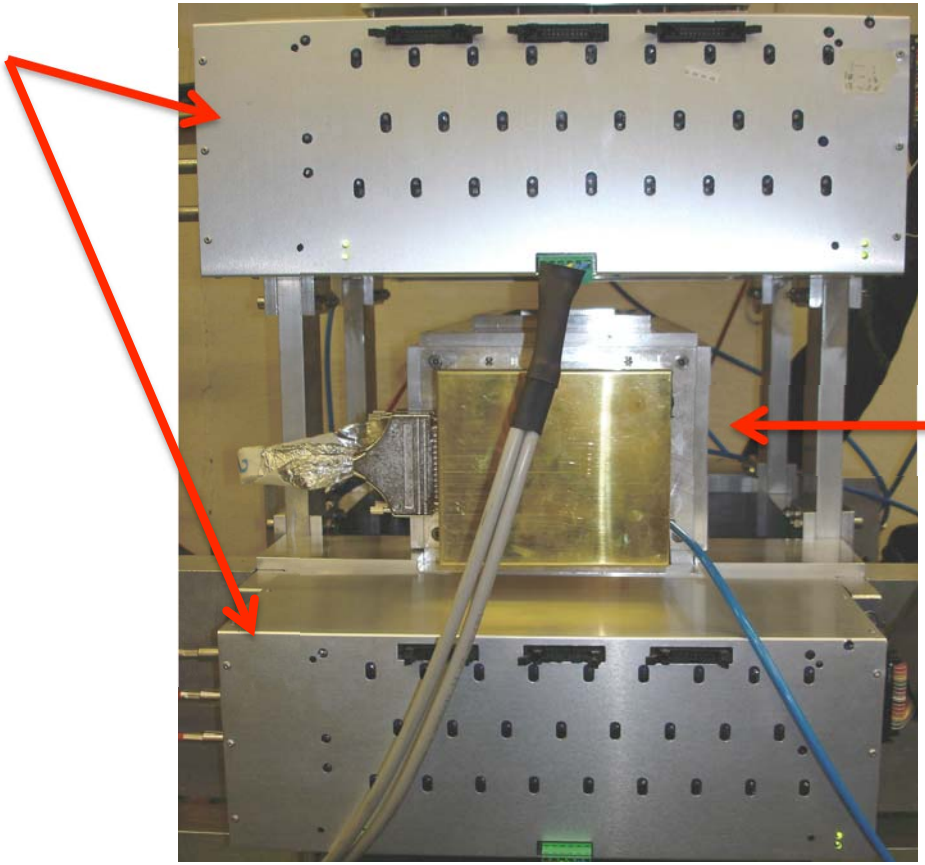
XII SuperB General Meeting

DCH-II parallel session
Annecy, 17 March 2010

Experimental Setup

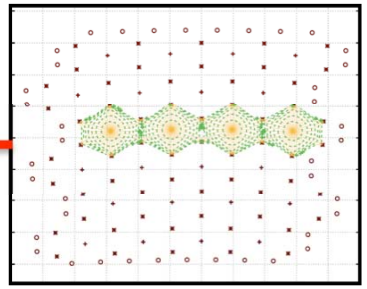
LST Telescope:

- Two identical assemblies of 26 tubes each
- 3 cm diameter, 100 µm wires
- 40%-60% Ar-iC_4H_{10} mixture

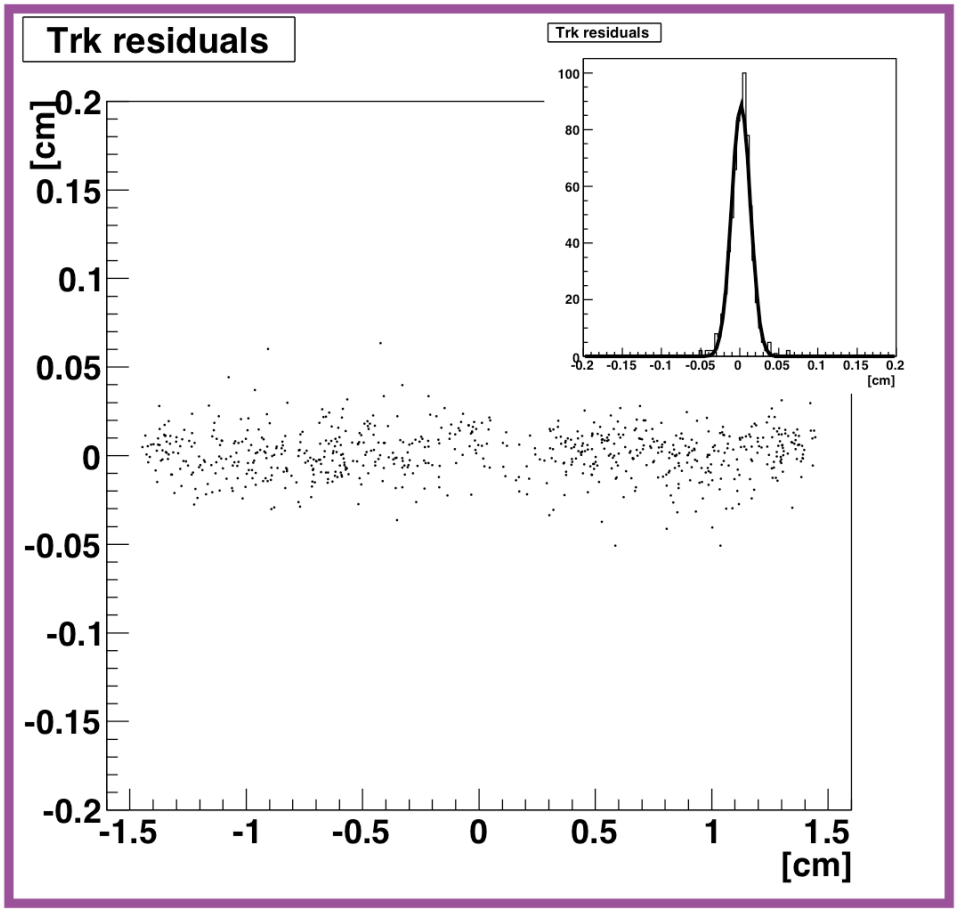


Prototype 1

- 6x4 hexagonal cells à la *BABAR*
  - Guard wires to ensure uniformity of electric field among cells
  - Aluminized mylar windows on entrance-exit faces

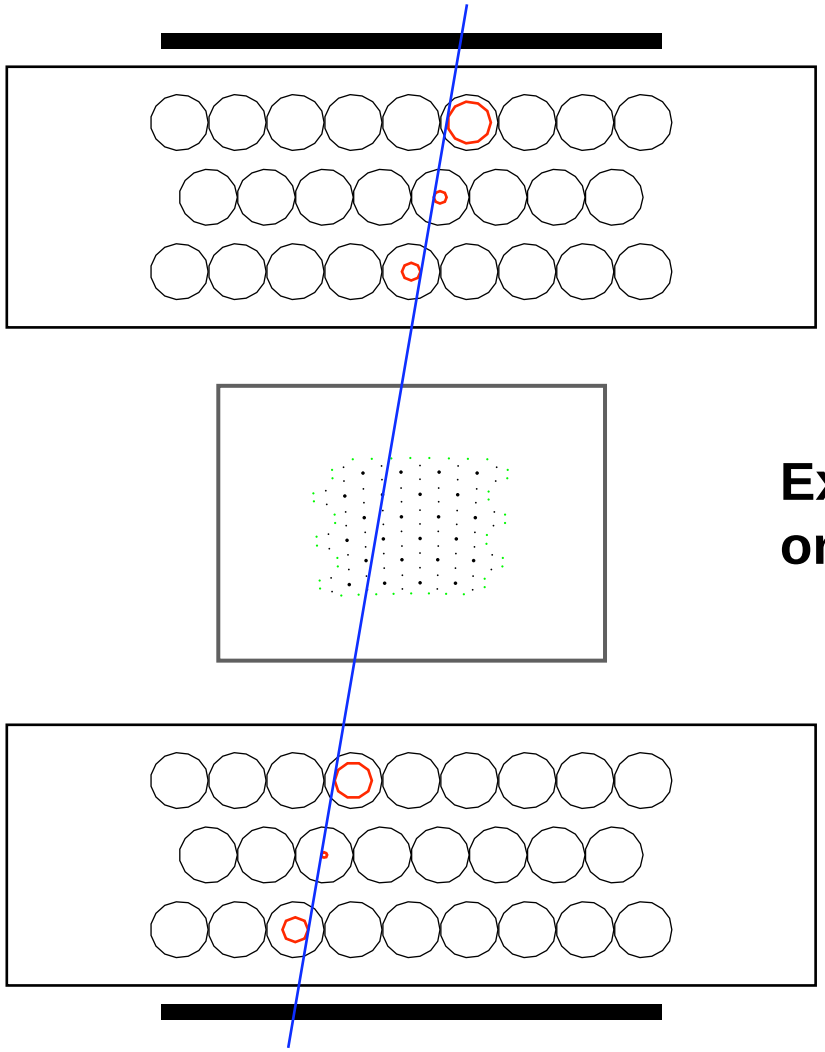


Track Impact Parameter Resolution



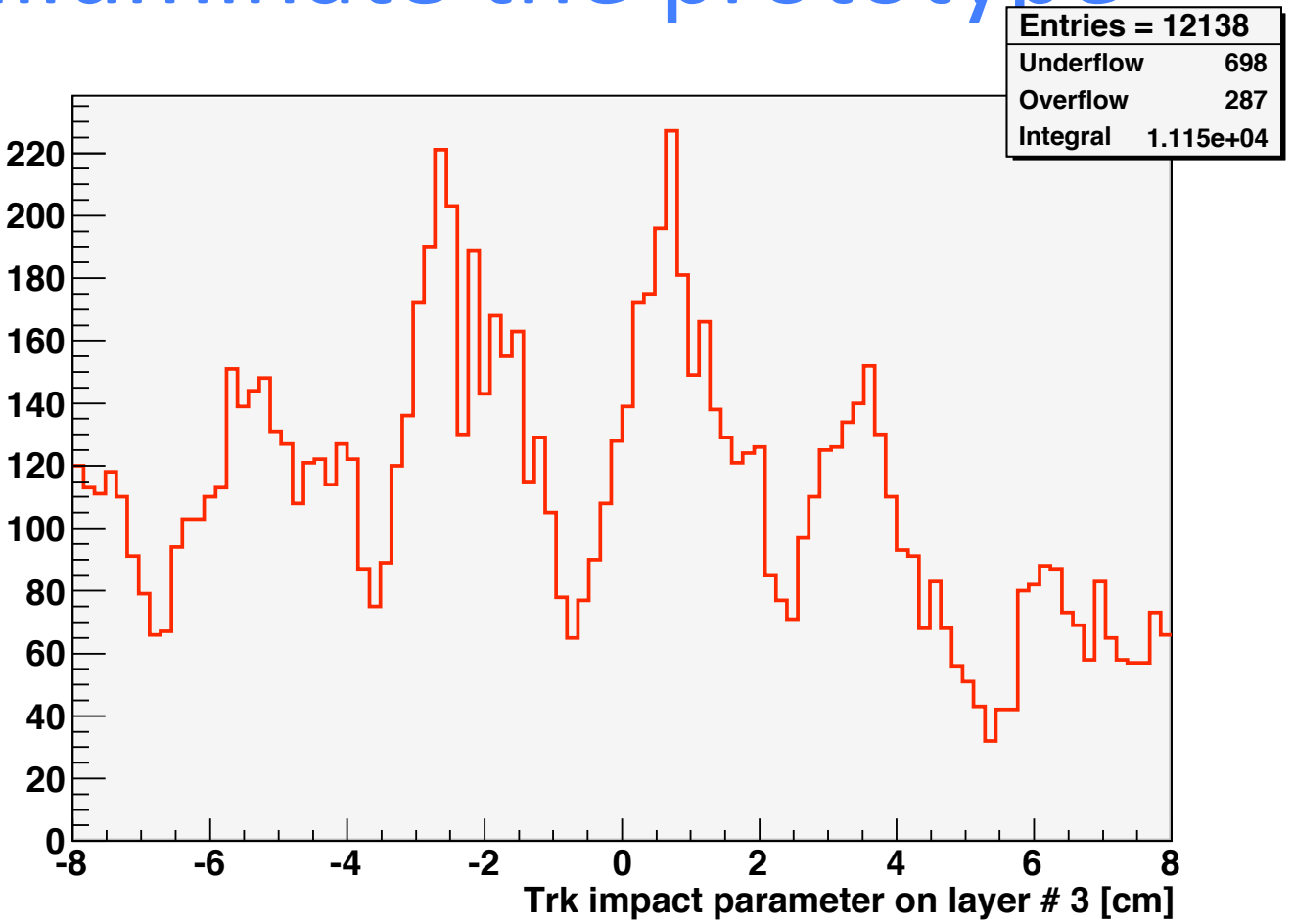
Telescope single tube spatial resolution ~100μm

Tracks extrapolated in Proto1

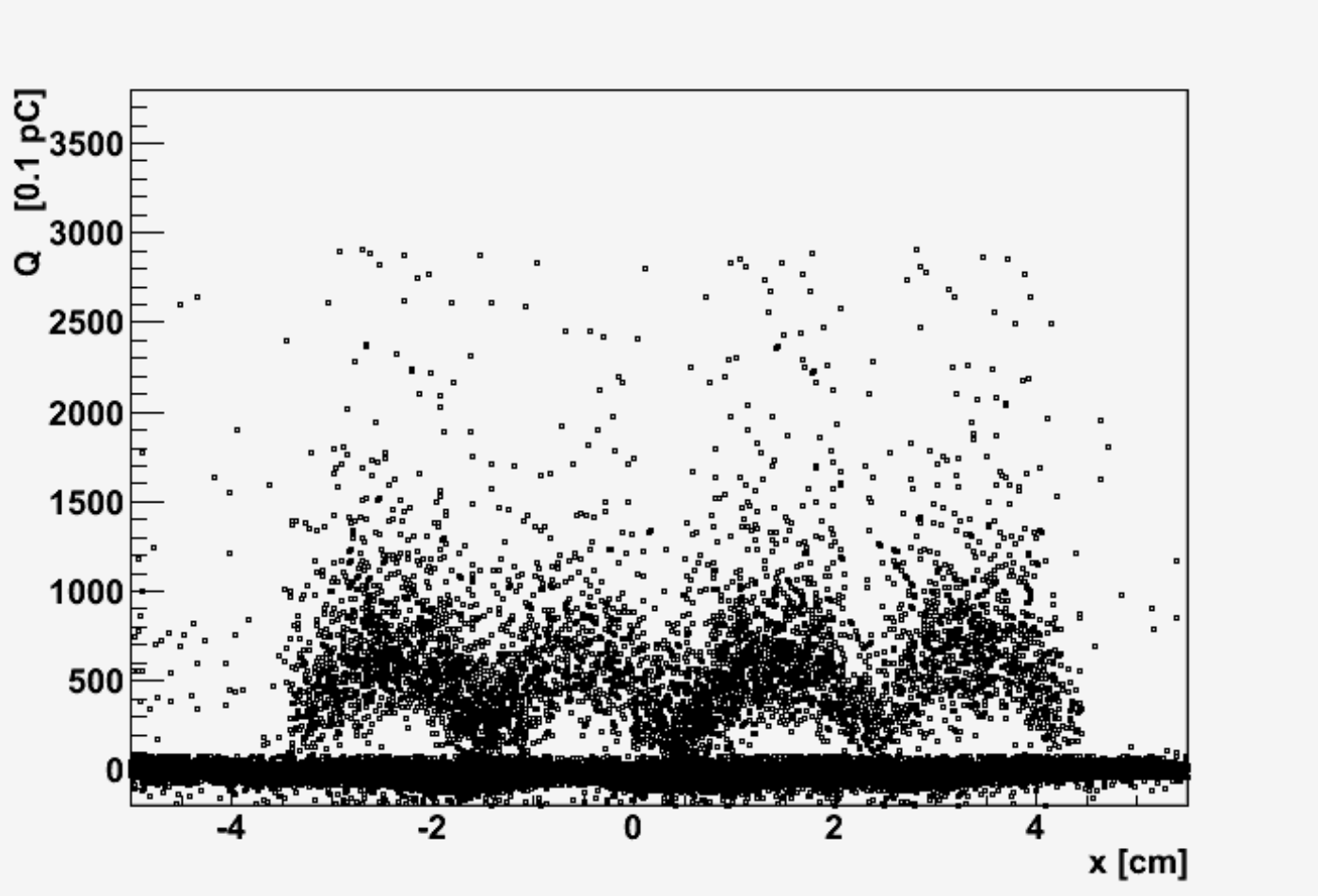


Expected extrapolation accuracy on drift chamber prototype ≤70μm

How tracked cosmic rays illuminate the prototype

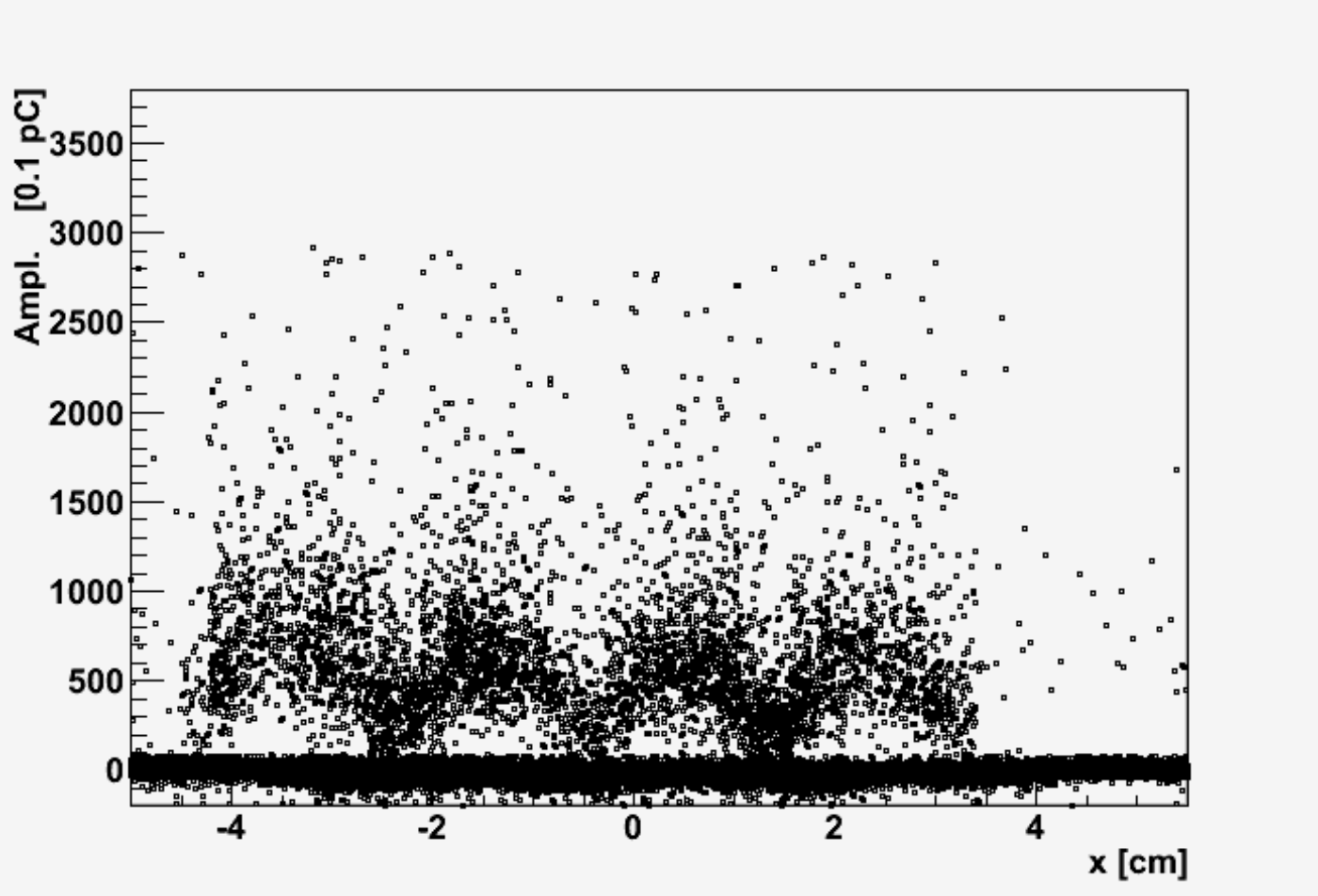


Charge profile in a layer



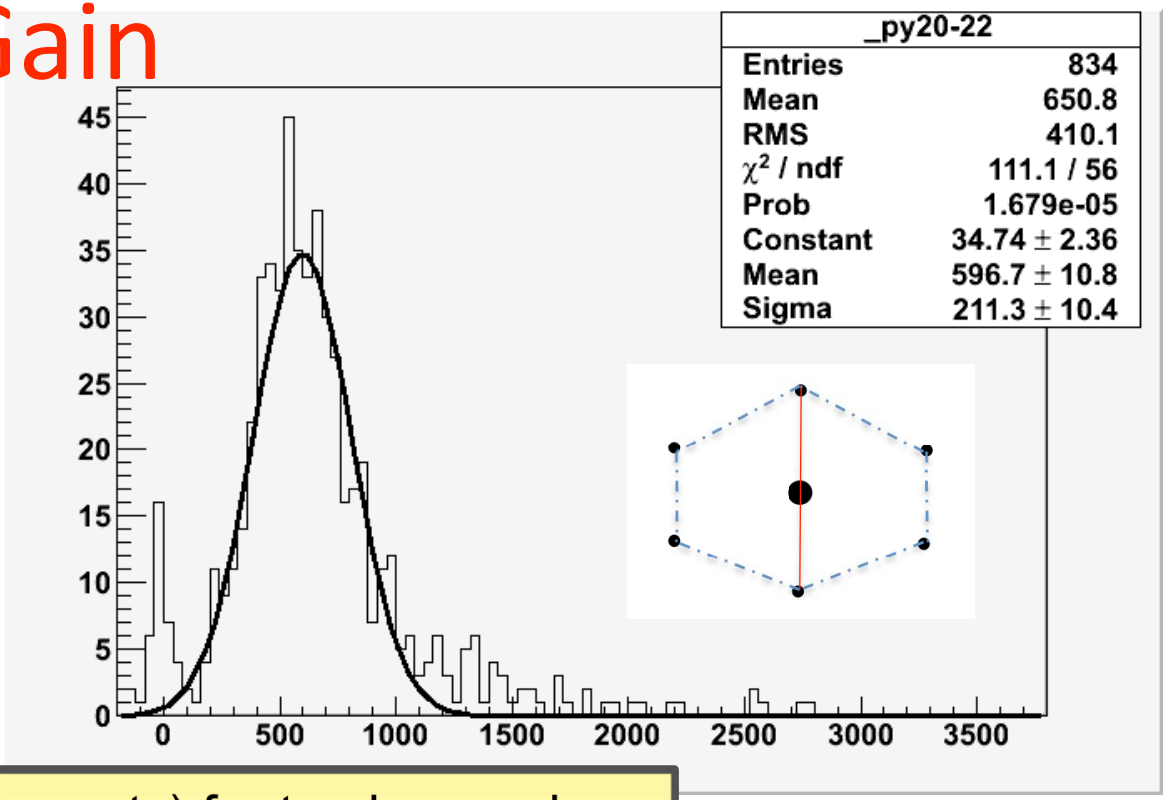
80%He-20%iC_4H_{10} @ HV=1960V

Charge profile in the next layer



80%He-20%iC_4H_{10} @ HV=1960V

Gas Gain



Charge spectrum (ADC counts) for tracks passing around the center of a cell (L~1.2cm) -

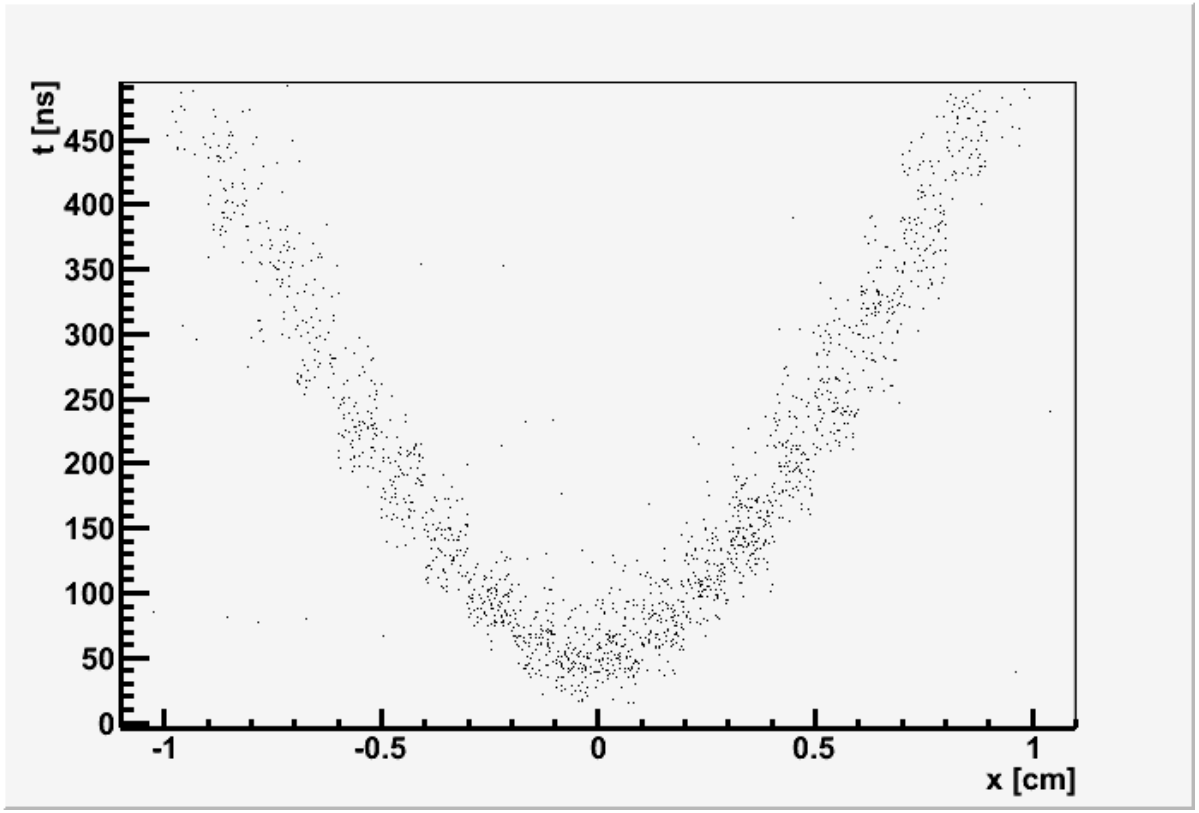
80%He-20%iC_4H_{10} @ HV=1960V G_{gas}~ 3 10^{-4}
90%He-10%iC_4H_{10} @ HV=1710V G_{gas}~ 6 10^{-4}
63%He-37%CH_4 @ HV=2410V G_{gas}~ 8 10^{-4}
63%He-37%CH_4 @ HV=2510V G_{gas}~15 10^{-4}
79%He-21%CH_4 @ HV=2110V G_{gas}~ 7 10^{-4}
79%He-21%CH_4 @ HV=2210V G_{gas}~14 10^{-4}

Space-Time Relations
&
Spatial Resolution

Disclaimer:

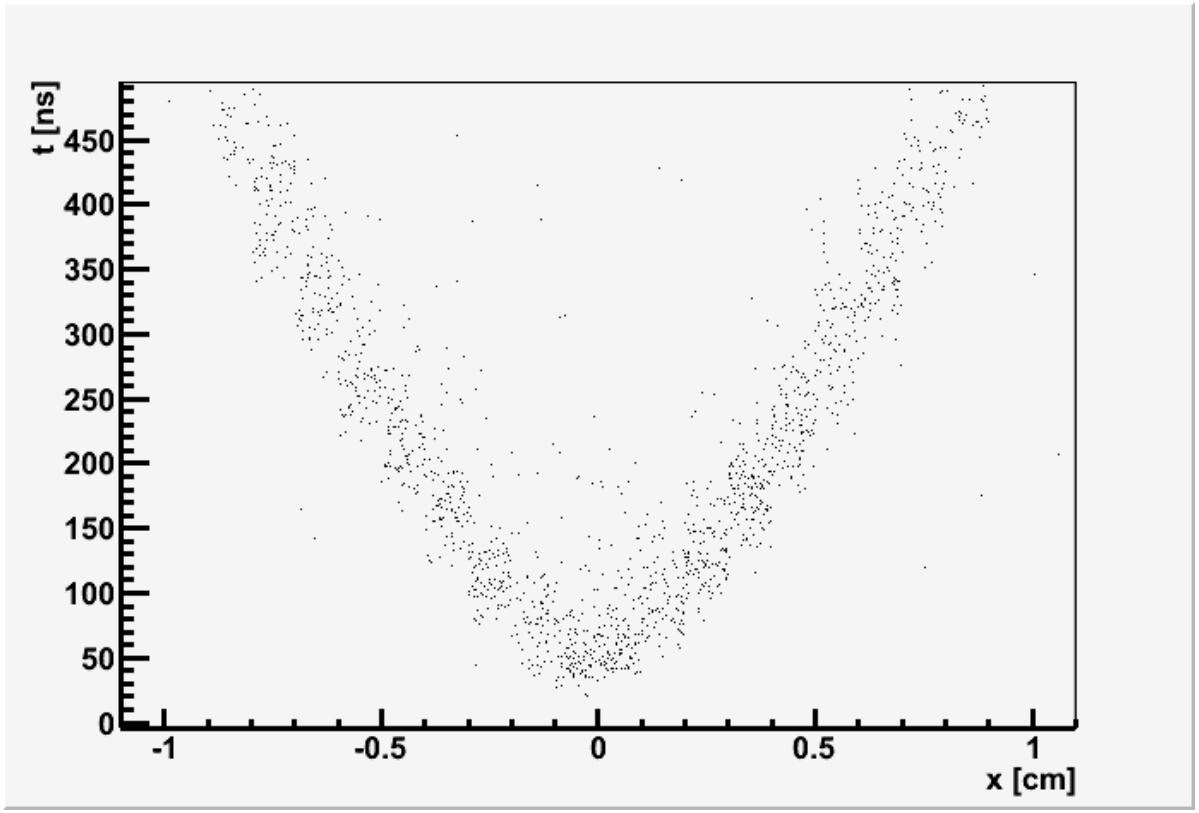
- Results shown on pages 10-19 to be considered VERY preliminary
- Still limited statistics from cosmic-ray runs
- Still approximate time-to-space relations
- Thresholds could be optimized…

Space-Time Relations



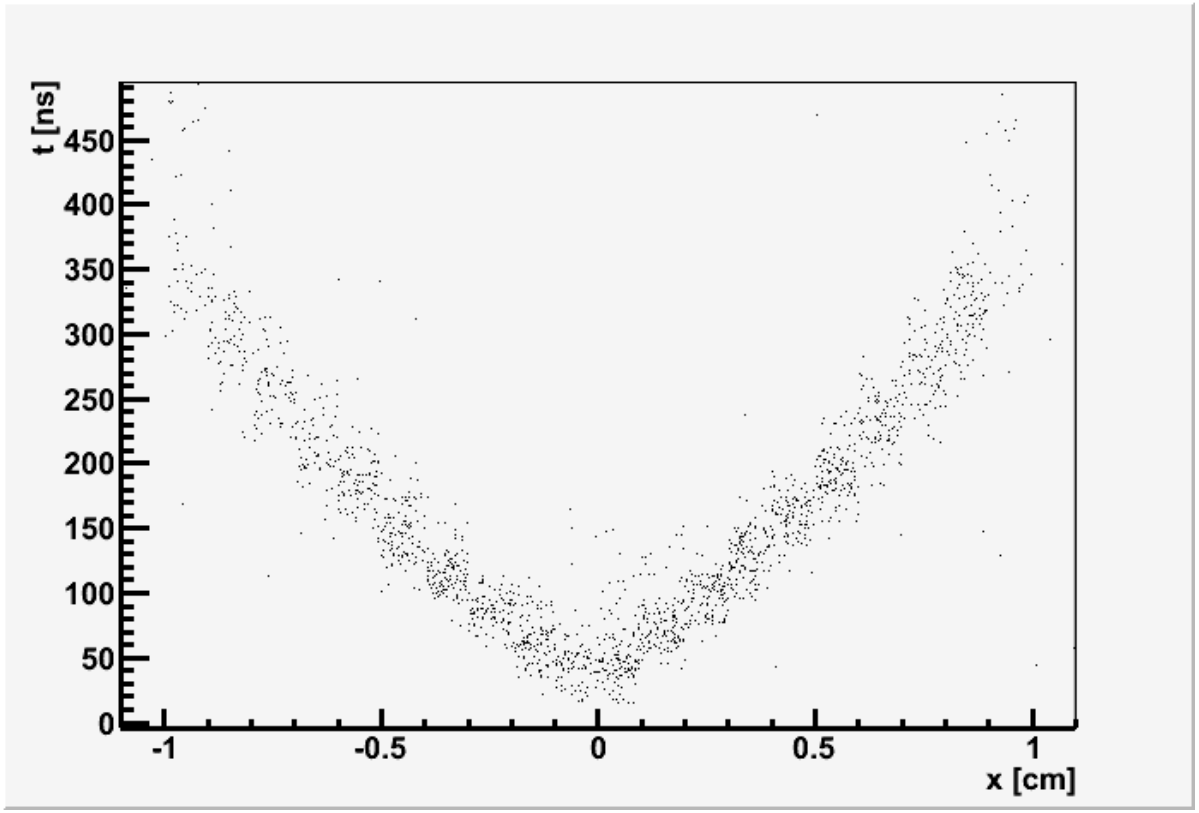
80%He-20%iC_4H_{10} @ HV=1960V

Space-Time Relations



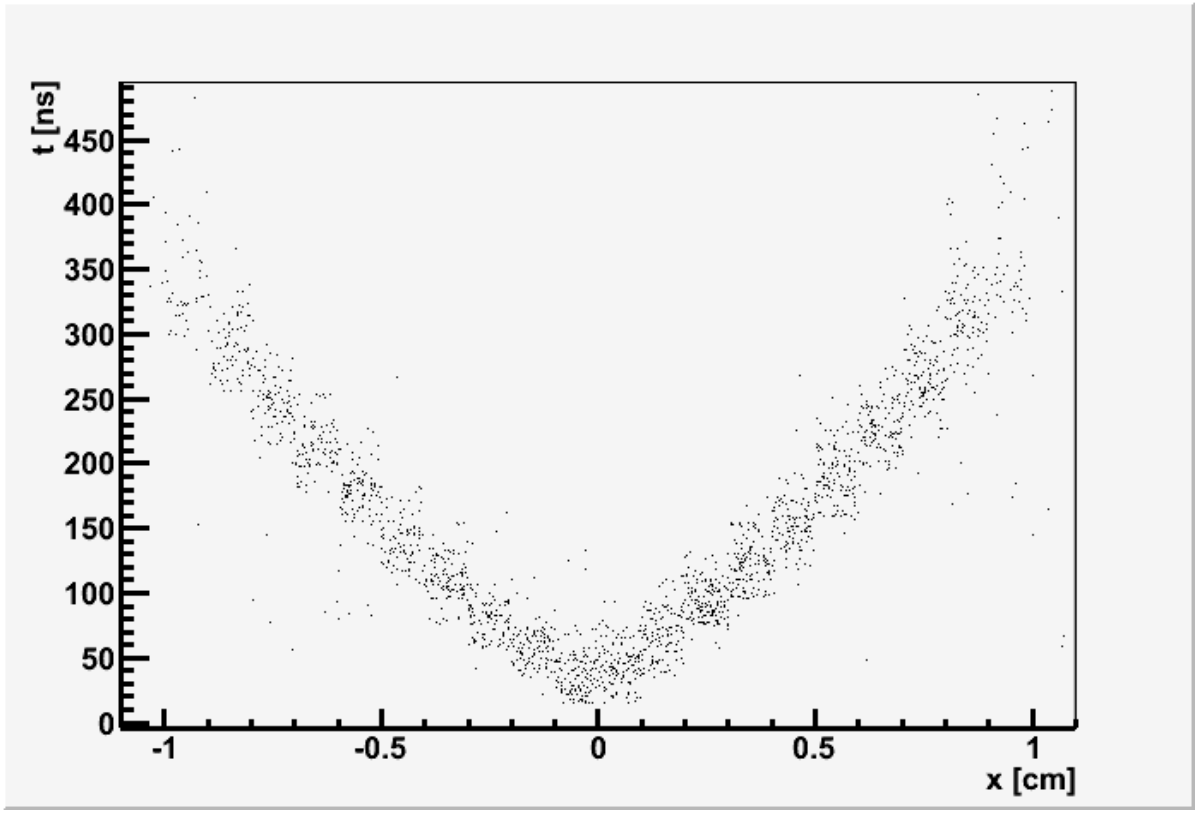
90%He-10%iC_4H_{10} @ HV=1710V

Space-Time Relations



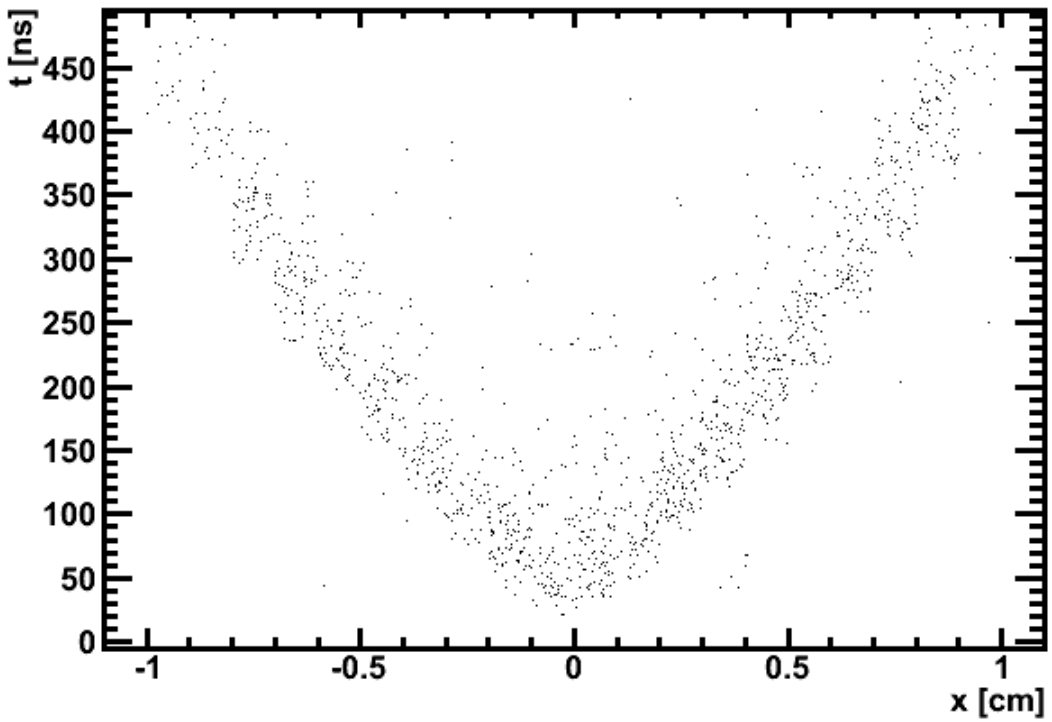
63%He-37%CH_4 @ HV=2410V

Space-Time Relations



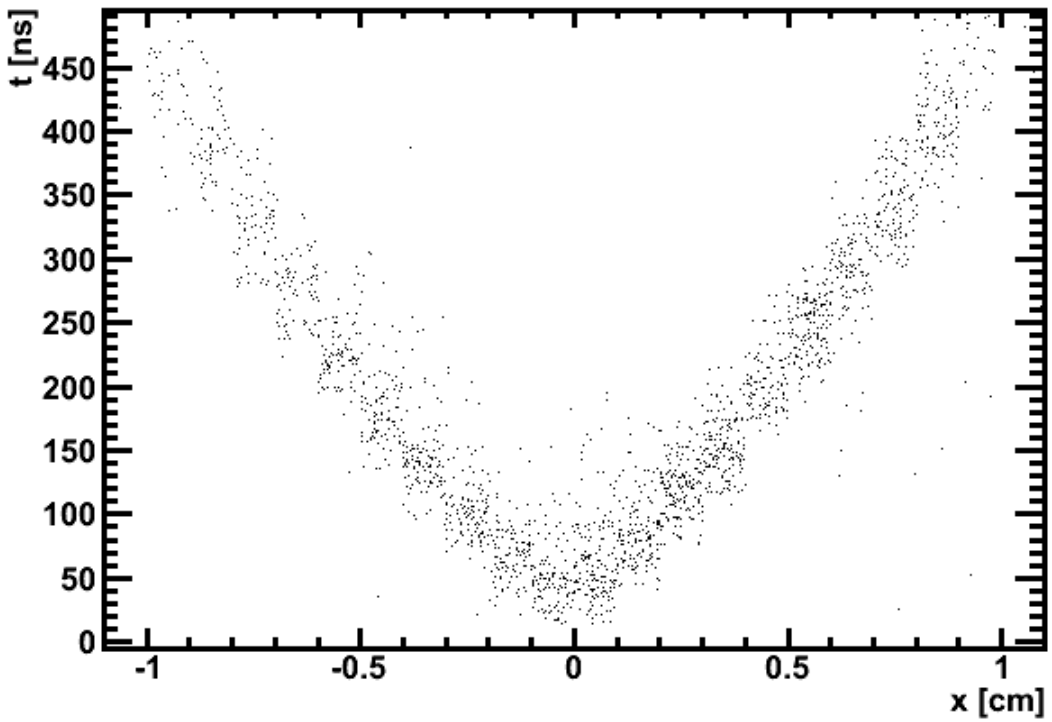
63%He-37%CH_4 @ HV=2510V

Space-Time Relations



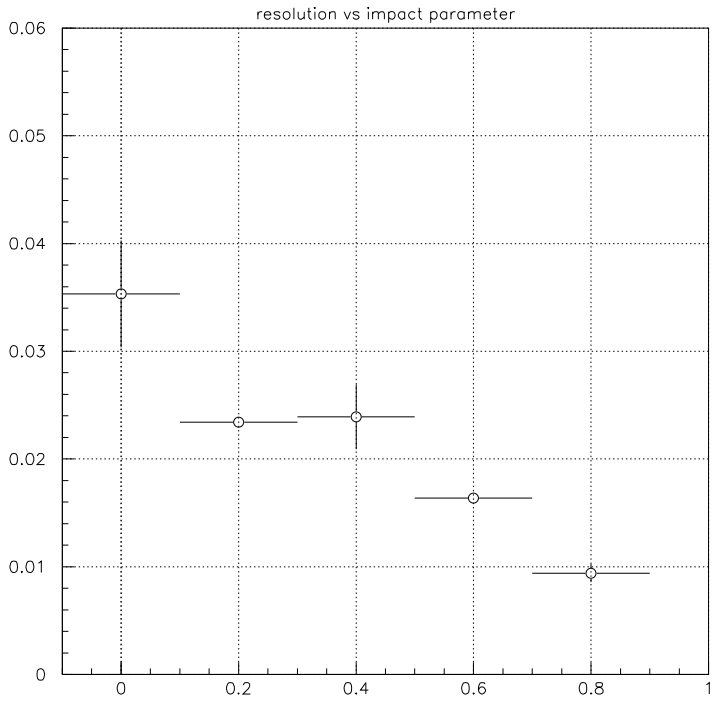
79%He-21%CH_4 @ HV=2110V

Space-Time Relations



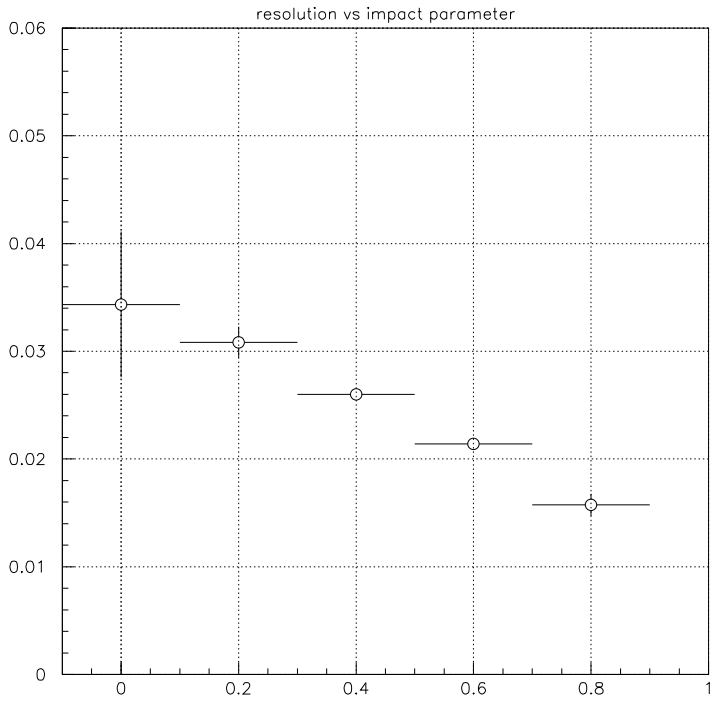
79%He-21%CH_4 @ HV=2210V

Spatial Resolution



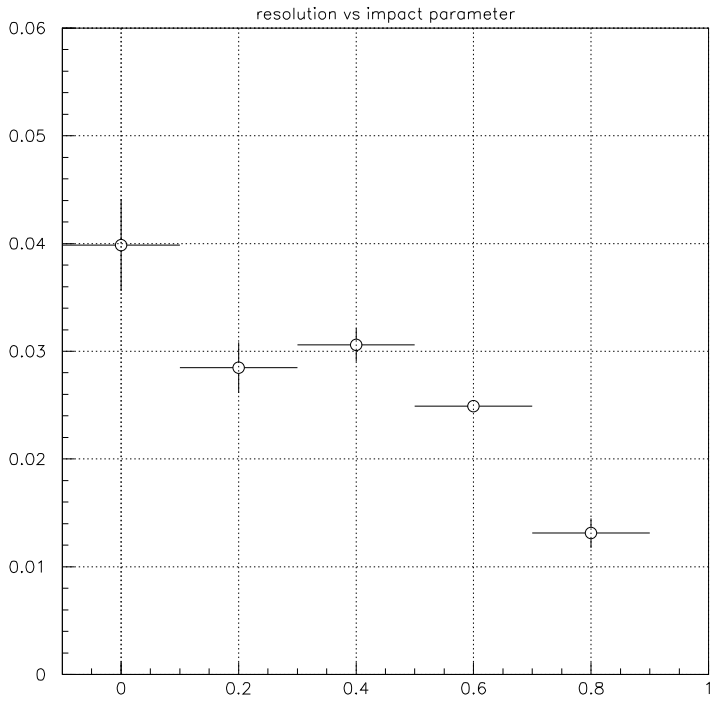
80%He-20%iC_4H_{10} @ HV=1960V

Spatial Resolution



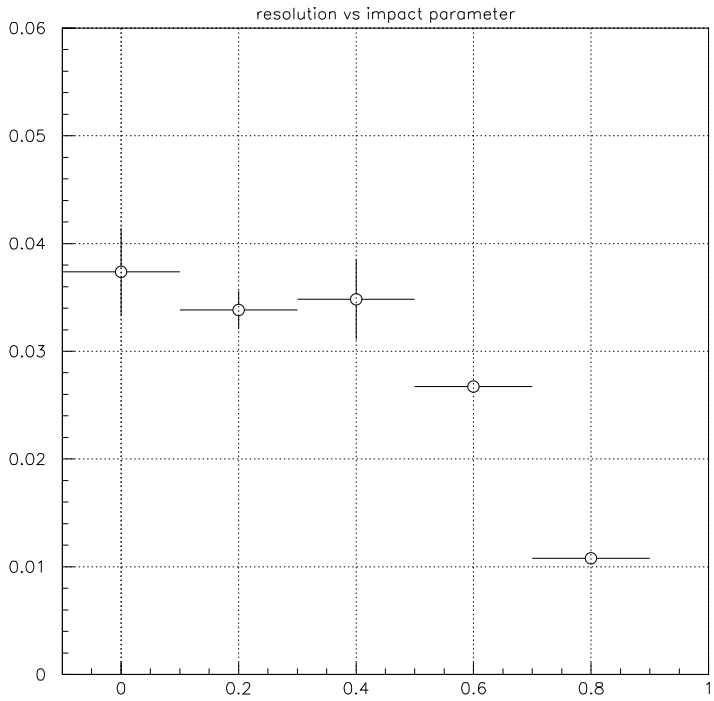
63%He-37%CH_4 @ HV=2410V

Spatial Resolution



63%He-37%CH_4 @ HV=2510V

Spatial Resolution



79%He-21%CH_4 @ HV=2210V

Summary

- Collecting cosmic ray data to study several gas mixtures
- First results appearing
  - Consistent with *BABAR* experience
  - Mixtures with very low Methane content could be well-suited for Cluster Counting (next planned step)