The PHENIX Multiplicity and Vertex Detector

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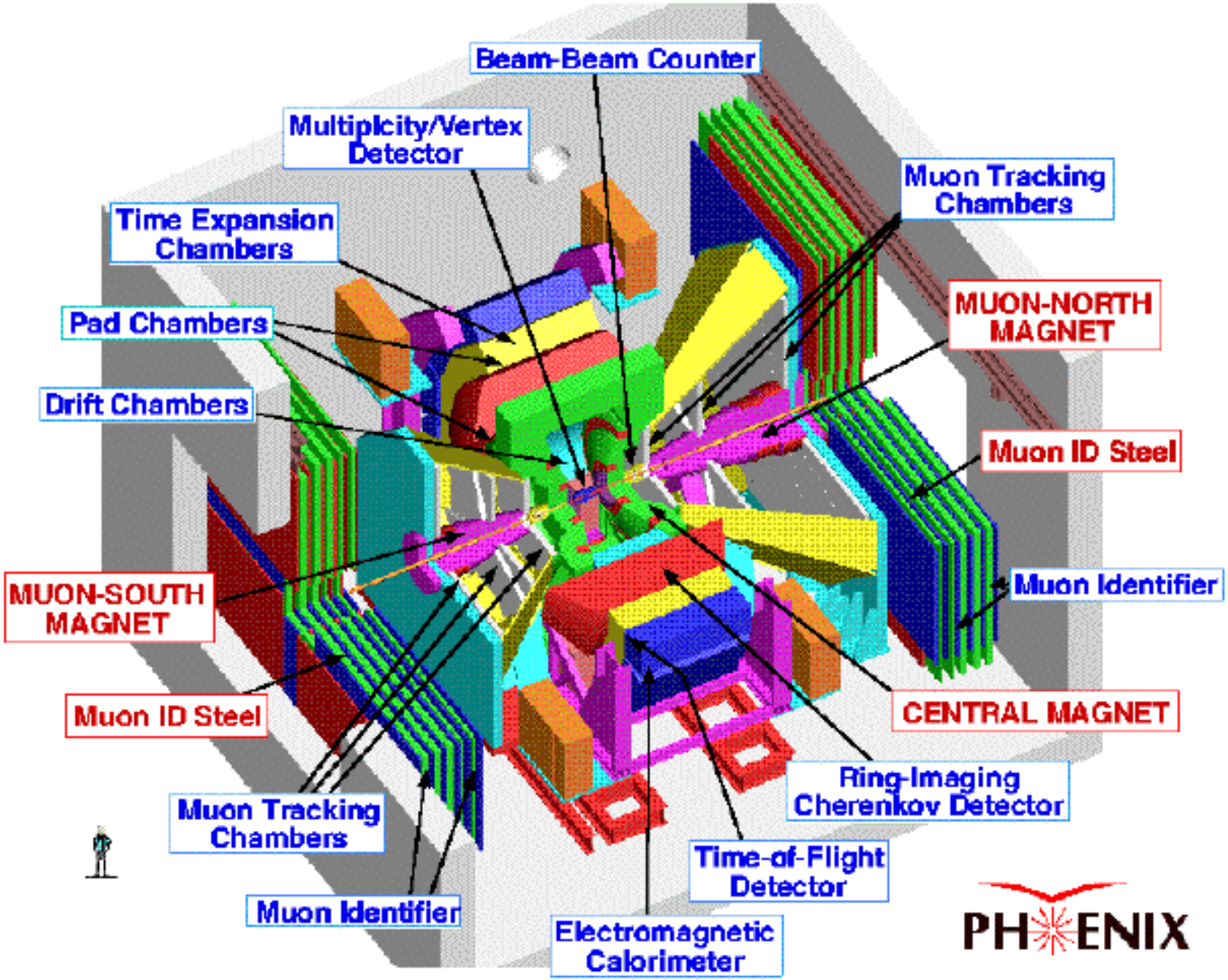
1. MVD Overview
2. Detectors and Electronics
3. Vertex Finding
4. Current Status


Beam-Beam Counter
Multiplicity/Vertex Detector
Time Expansion Chambers
Pad Chambers
Drift Chambers
Muon Tracking Chambers
MUON-NORTH MAGNET
Muon ID Steel
Muon Identifier
MUON-SOUTH MAGNET
Muon ID Steel
CENTRAL MAGNET
Ring-Imaging Cherenkov Detector
Muon Tracking Chambers
Time-of-Flight Detector
Muon Identifier
Electromagnetic Calorimeter
PHENIX

MVD Overview:

Physics goals:

Charged particle multiplicity

Centrality trigger at LVL-1

Collision vertex position ($\sigma < 2$ mm)

$dN/d\eta$ $d^2N/d\eta d\varphi$

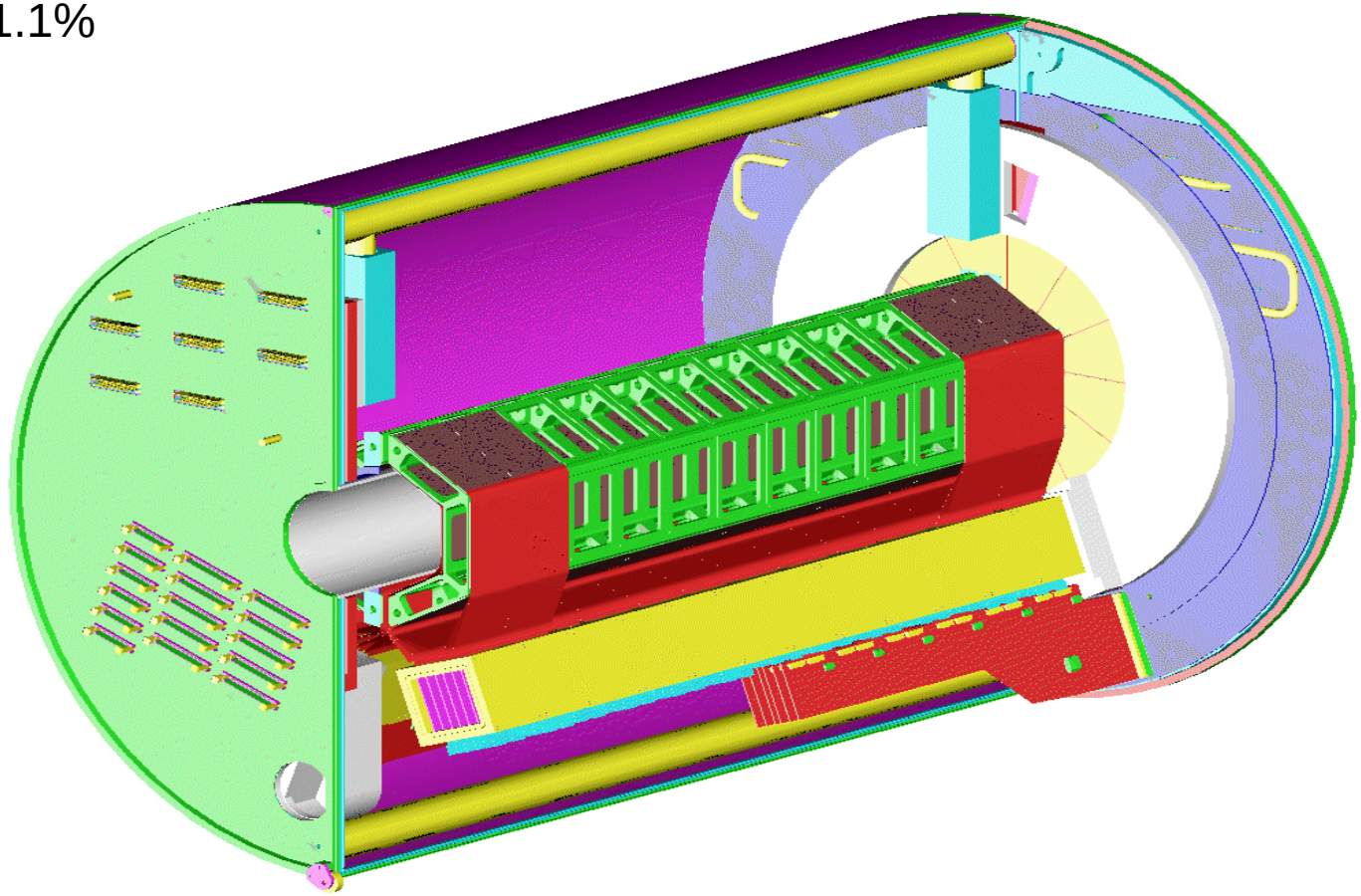
Design Criteria:

Large rapidity coverage ($\Delta\eta = 5$)

Good azimuthal coverage & granularity

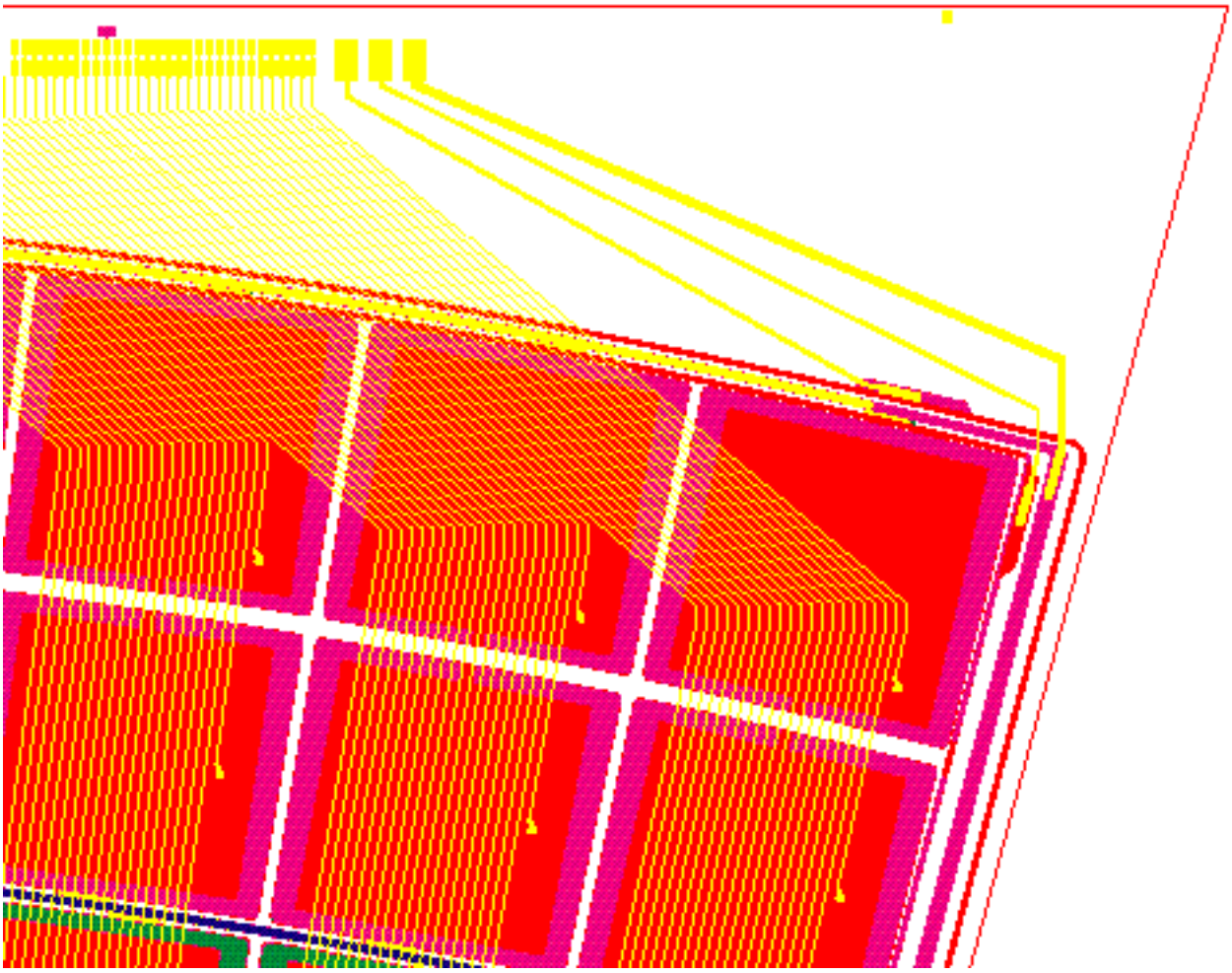
Minimal material in central arms acceptance

Clamshell design - mounts to magnet pole faces.
Inner and outer barrels of silicon strip detectors, 200μm, 64cm length
Silicon pad endcaps @ +/- 35cm
Rad length ≈ 1.1%
Weight < 30lb



Strip electronics at bottom - Multichip Module
256 channels/detector
Channel count = 34,816

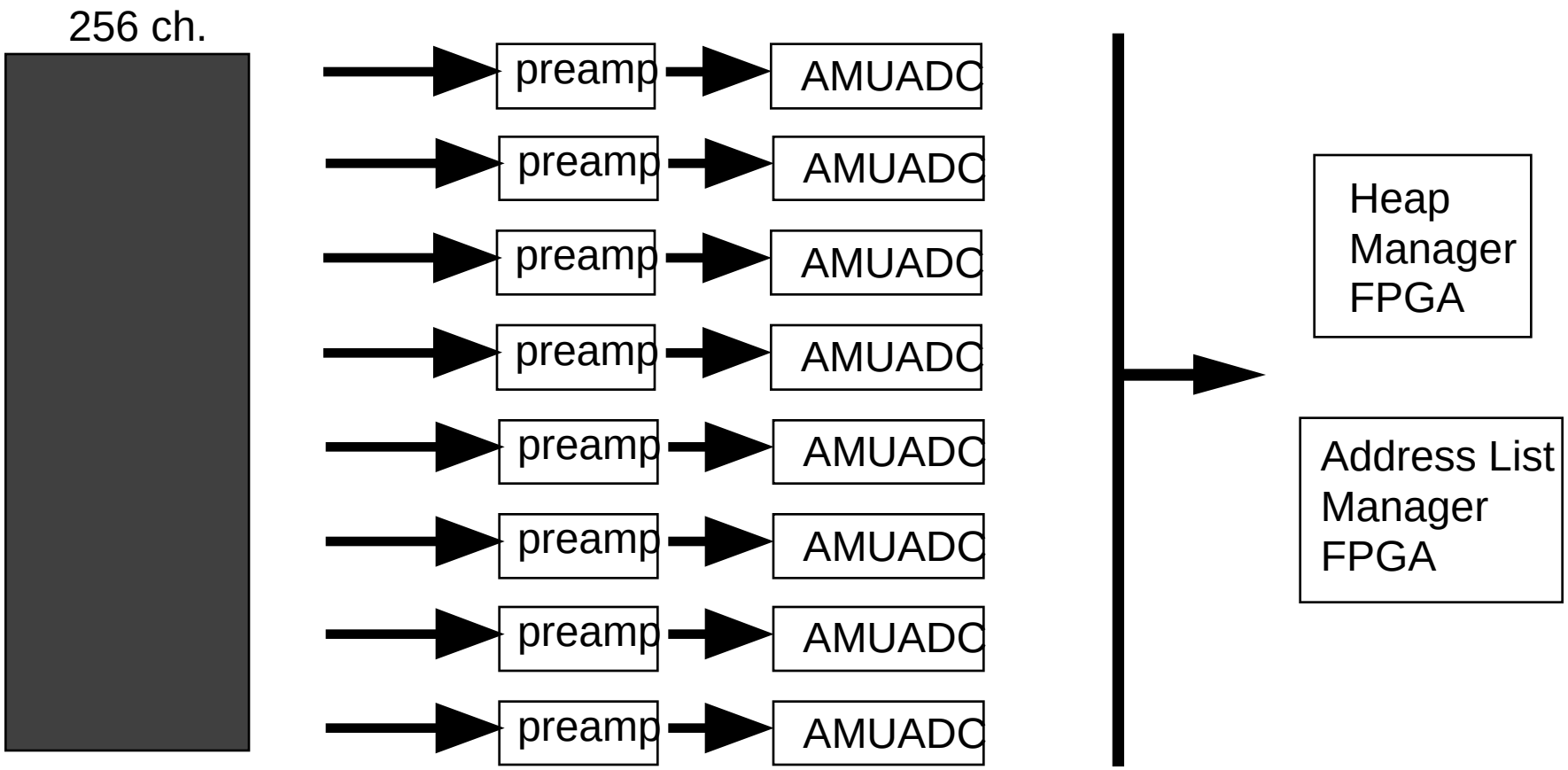
Double Metal Pad Detector

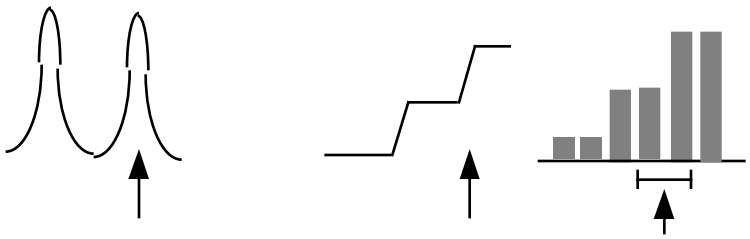


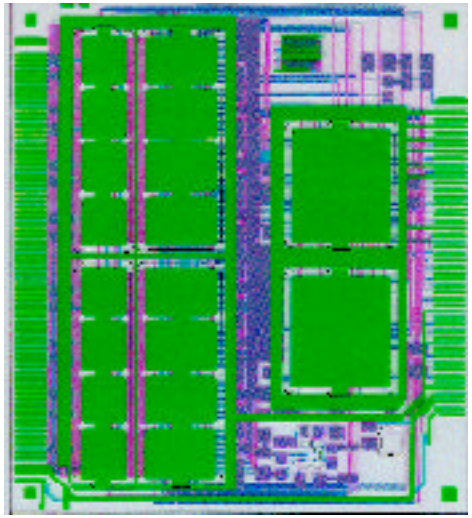
* Eliminates specialized kapton cable
* Reduces wirebonding
* Facilitates detector probing
* Facilitates assembly, handling
* Increases yield
* Sequential readout

Jehanne Simon-Gillo, *LANL*
PHENIX Collaboration Meeting, July 26, 1996

Front End Electronics:

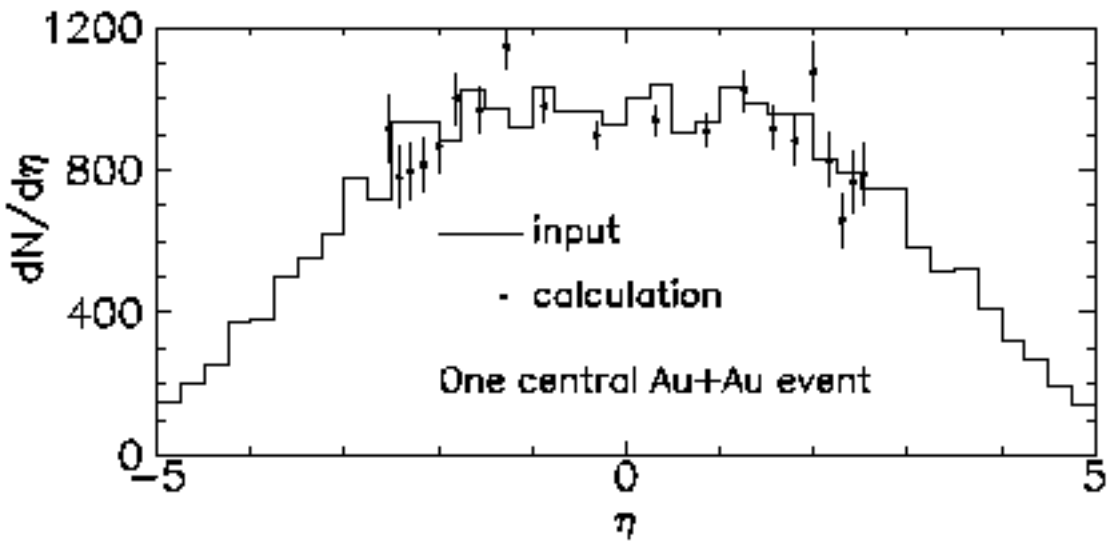






MVD Global Measurements:

$$\eta = -\ln(\tan \theta/2)$$

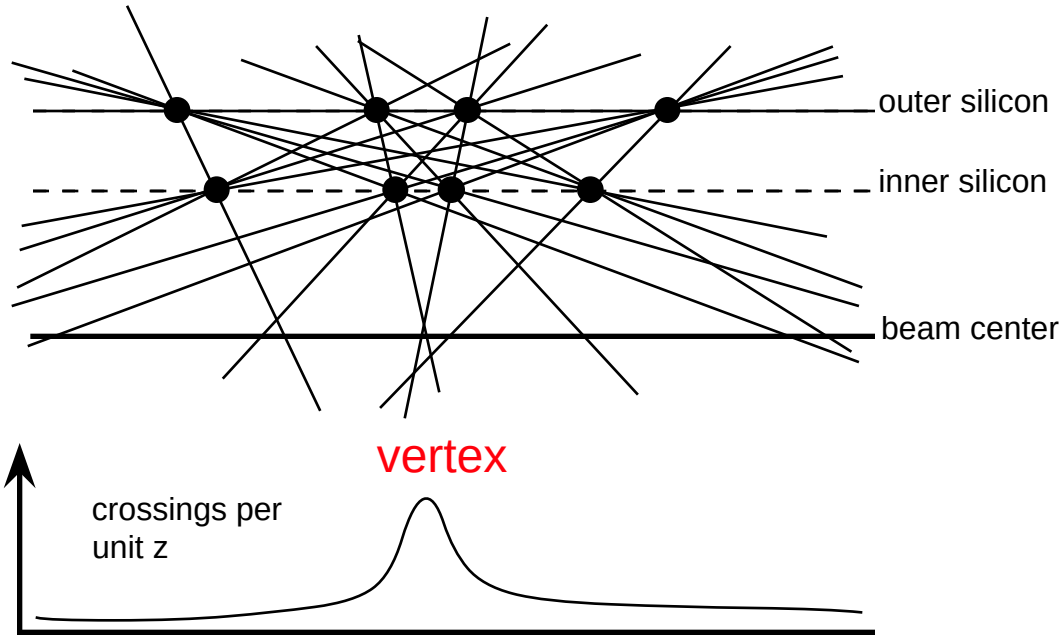


$$\varepsilon = \frac{dN}{d\eta} \frac{1}{\pi R_T^2 \tau_0} \sqrt{\langle p_T \rangle^2 + m_\pi^2}$$

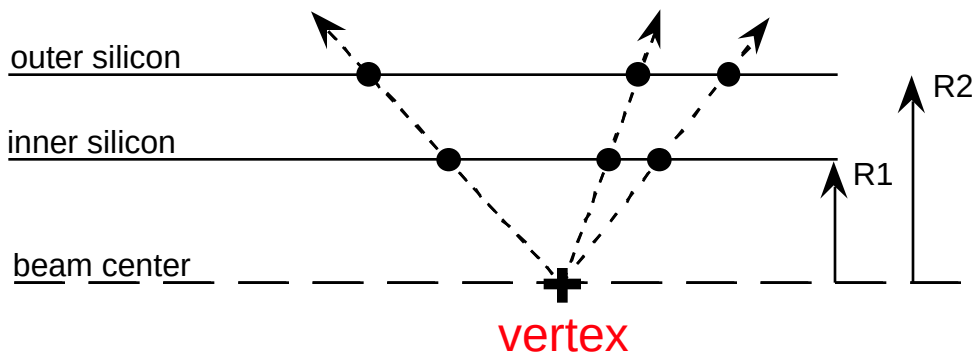
expected $\varepsilon \approx 2$ GeV/fm^3

Pb nucleus $\varepsilon \approx 0.15$ GeV/fm^3

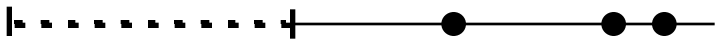
The pseudo-tracking algorithm:



The correlation algorithm:



offset + outer silicon hits scaled by $\frac{R1}{R2}$

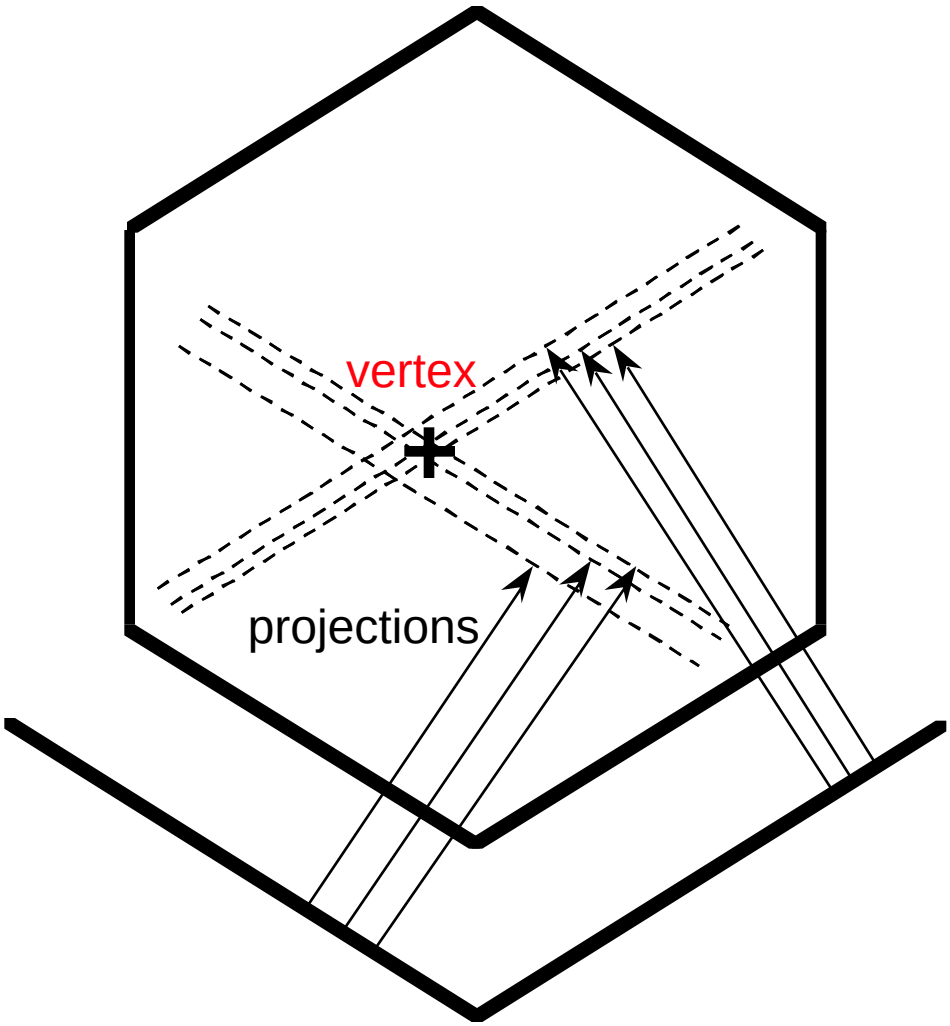


offset scaled by $\frac{R2}{R1}$ = vertex position

3D Vertex Finding:

Z-plane determined by previous step.

fully populated inner barrel.



partially populated outer barrel.

MVD Construction Status:

All mechanical and electronic components prototyped or in fabrication.

- Si pad detectors starting production.
- Si microstrip detectors in production.
- Rohacell C-cages in production at UCR.
- All custom die are manufactured - KGD testing.
- MCMs starting production.
- All custom electronics boards are in fabrication.
- All kapton cables are in production.
- Cooling system currently being assembled.

Construction complete at LANL in spring of '99

Installation in PHENIX in June of '99

First heavy- ion beam in October of '99