

Summer internship plan: a directional study of Bi-207 calibration sources in the context of the 600-800 keV energy spectrum plateau.

Presented by:

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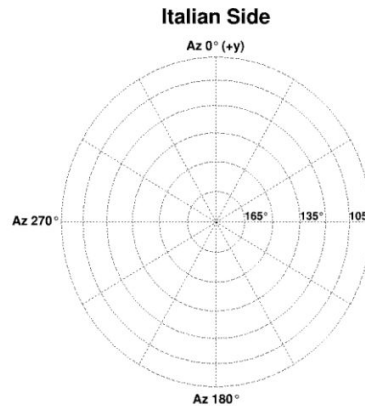
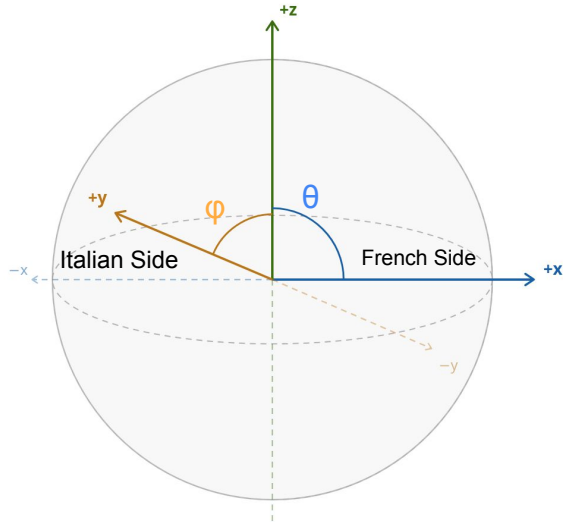
Under advisement of **Miroslav Macko**²



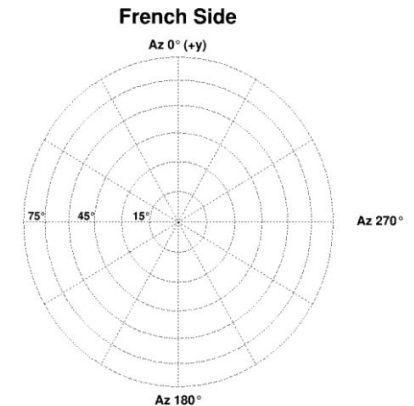
ROOT analysis scripts are being developed to understand the plateau better.

- Previous work has identified the plateau as a result of electron scattering through the calibration sources' copper envelope frame.
- Three histogram-based tools are currently available for each calibration source:
 - Electron trajectory comparisons (azimuth and zenith angles).
 - Trajectory projection point (TPP) distance from calibration source vs. electron trajectory angle.
 - Trajectory angle dependent TPP distributions.

The full 3D geometry of a sphere can be projected onto a 2D plane.



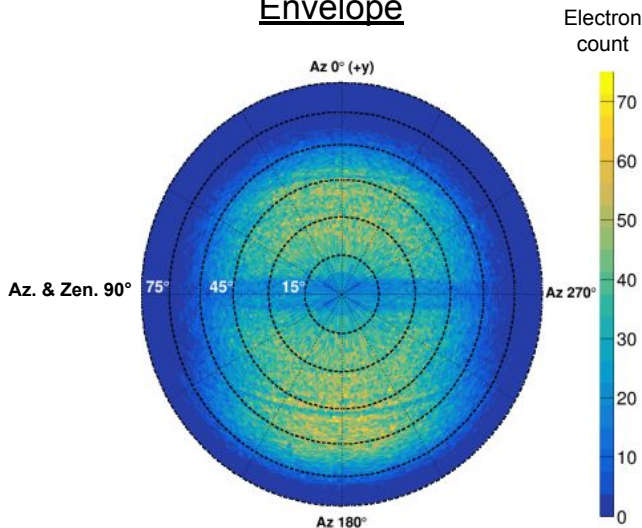
Az & Zen. 90°



- **Zenith (θ):** 180 degrees ($+x$ to $-x$)
- **Azimuth (ϕ):** 360 degrees (increasing CCW from $+y$ as viewed from $+x$)

There are slight differences in angle trajectories between envelope and non-envelope electrons in sources closest to the xcalo wall.

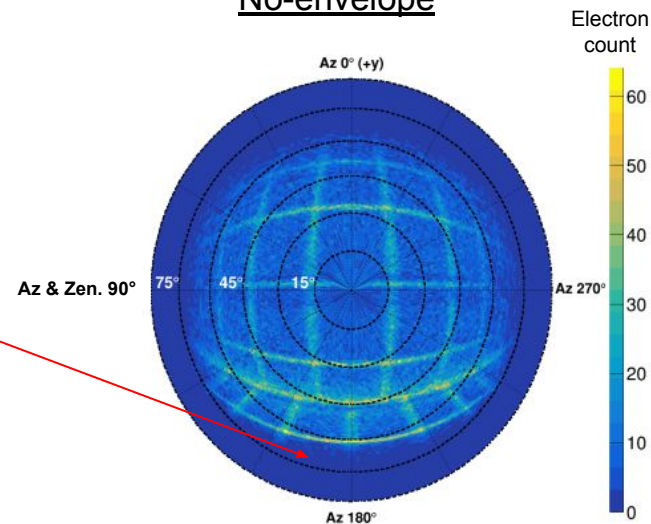
Envelope



French Side,
600-800 keV range.

There is a clear
quantitative
difference for
 $60 < \theta < 80$.

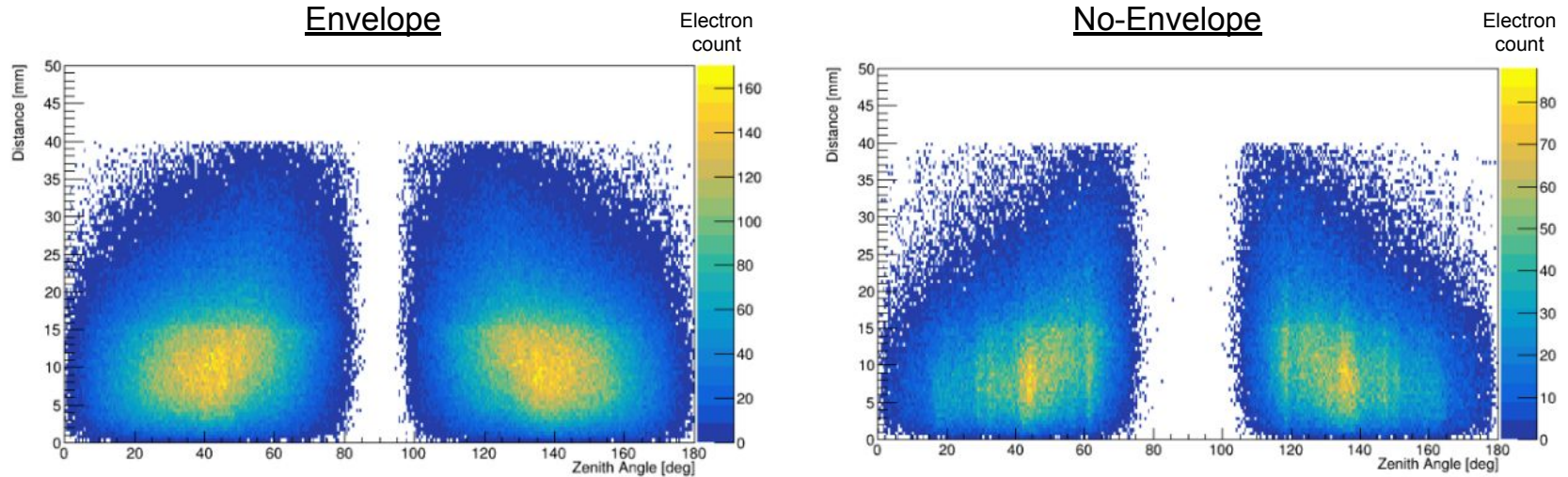
No-envelope



- The horizontal deficit is a trait shared across all sources.

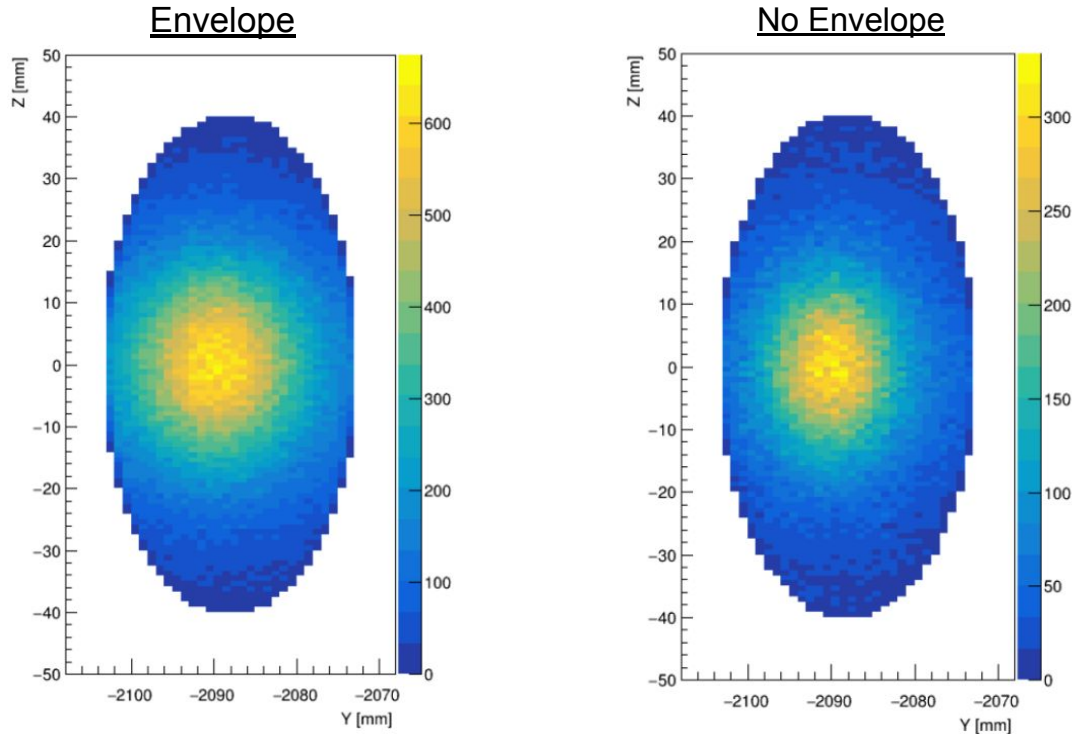
- The grid shape is believed to be a relic from the optical modules.

The contrast is easier to see in distance from TPP to calibration source vs. θ histograms.



- The 40 mm edge is expected from the ellipse data cut.

TPP distributions provide little insight ($\theta \geq 60^\circ$)



- Suggests that another method needs to be pursued to understand the behavior better.

Summary

Analysis tools are being developed to understand the plateau better.*

- Many of the effects seen in the plots are still being understood.
- Slight contrasts appear in sources closer to the xcalo wall.
 - The toolset does not currently provide a generalized way to differentiate all the envelope events in a given source nor any events in the center sources of the detector.

However, differences in envelope and non-envelope calibration source electrons have been observed in the PTD data bank, which warrants further investigation.