

Photon reconstruction in the Preradiator

- **Goal**

Collect all hits produced by a photon with maximum possible separation from other photons.

- **Simulation**

1. For each wire, only one hit (first in time) is accounted.
2. 100% efficiency of the chamber
3. x and y coordinates are known
4. for track search: $x_{\text{hit}} \rightarrow x_{\text{wire}}$

- **Clumps in the plane**

Hits i and j are in the same clump in plane k if

$$|x^{i,k} - x^{j,k}| < 1 \text{ cm}$$

$$x_{\text{hit}}^{i,k} \Rightarrow \tilde{x}_{\text{clump}}^{i,k}$$

(same for y -plane)

- **Track projection**

Clumps $\tilde{x}^{i,k}$ and $\tilde{y}^{j,m}$ are in one track (projection) if

$$|\tilde{x}^{i,k} - \tilde{x}^{j,m}| < 5 \text{ cm} \quad \text{and} \quad k+1 \leq m \leq k+2$$

$t_x^{k,m}$ means x -projection of the track, beginning at plane k and ending in plane m

- **Combining x and y projections**

$t_x^{i,j}$ & $t_y^{k,m}$ if $|i - k| \leq 1$ and $|j - m| \leq 1$

or $t_x^{i,j}$ & $t_{y1}^{k,l}$, $t_{y2}^{m,n}$ if $|i - k| \leq 1$, $|k - m| \leq 1$, $|j - n| \leq 1$

- **Track direction**

For each track, track direction was determining using hits in first 3-4 planes.

Track parameters x, y, z, t_x, t_y corresponds to the starting point of the track.

- **Combining tracks into “photon cluster”**

Tracks 1 and 2 (z_2, z_1) are in one photon cluster if

$$|x_2 - x_1 - t_{x1}(z_2 - z_1)| < 0.6(z_2 - z_1)$$

and

$$|y_2 - y_1 - t_{y1}(z_2 - z_1)| < 0.6(z_2 - z_1)$$

Results

Particle	Momentum (MeV/c)	Angle (mrad)	1 shower	> 1 showers
γ	50	0	6866	309
γ	100	0	6947	373
γ	100	100	7001	346
γ	100	200	7490	541
γ	100	500	8316	952
γ	250	0	7163	486
γ	500	0	7295	483
e	100	0	9499	492
μ	10000	0	9981	19
n	200	0	117	432
n	750	0	2826	1035

Table 1: Number of detected showers in preradiator per 10000 incident particles. If the starting point of the second reconstructed track is within the 600 mrad cone of the starting point of the first track, the tracks are in one shower.