Wide Angle Bremmstrahlung using only ECal information

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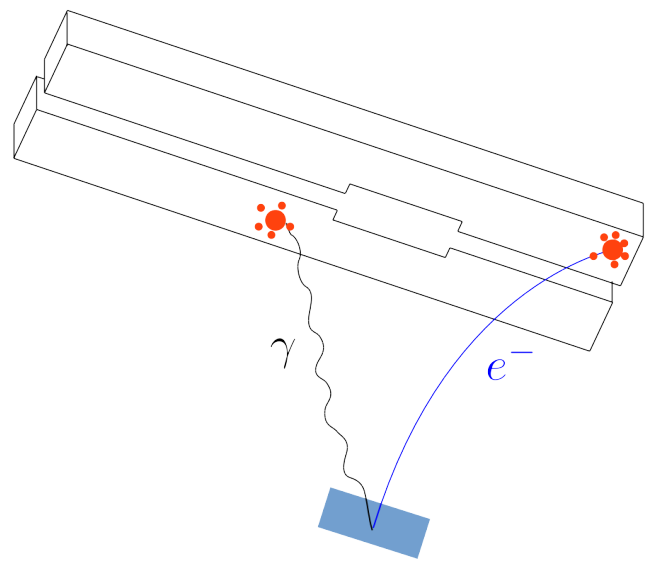
Motivation

- Check whether SVT is responsible in DATA/MC discreplancy
- WABs can be identified without using SVT information

Study Data (5772), pure WAB sample, and mixed Monte Carlo

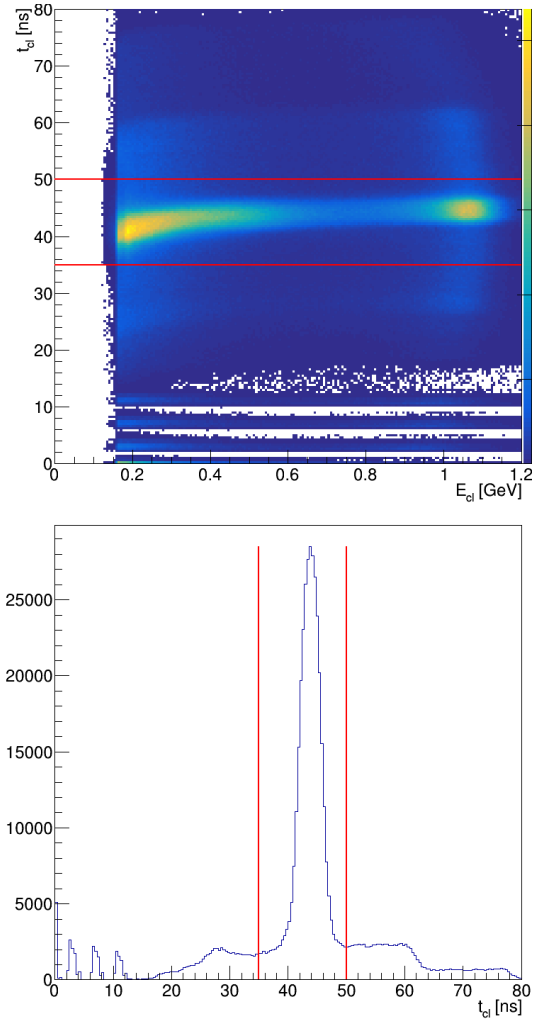
Event selection

- pair0
- $E_{cl} < 0.8\ GeV$
- $t_{cl} \in [30 - 50]\ ns$
- Photon and e^-: $E_{e^-} + E_\gamma = E_b$
- Use coplanarity
- Fiducial
- time coincidence
- background estimation

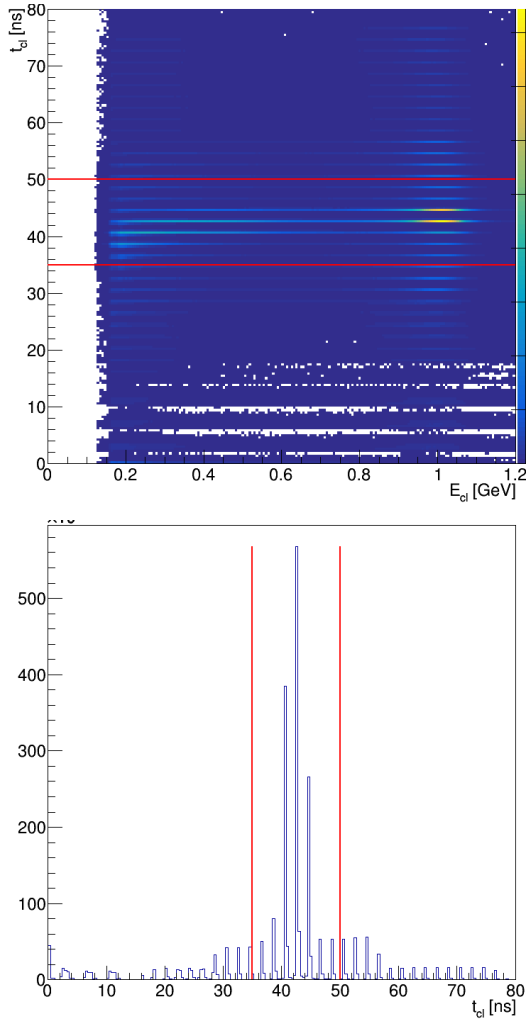


Event selection

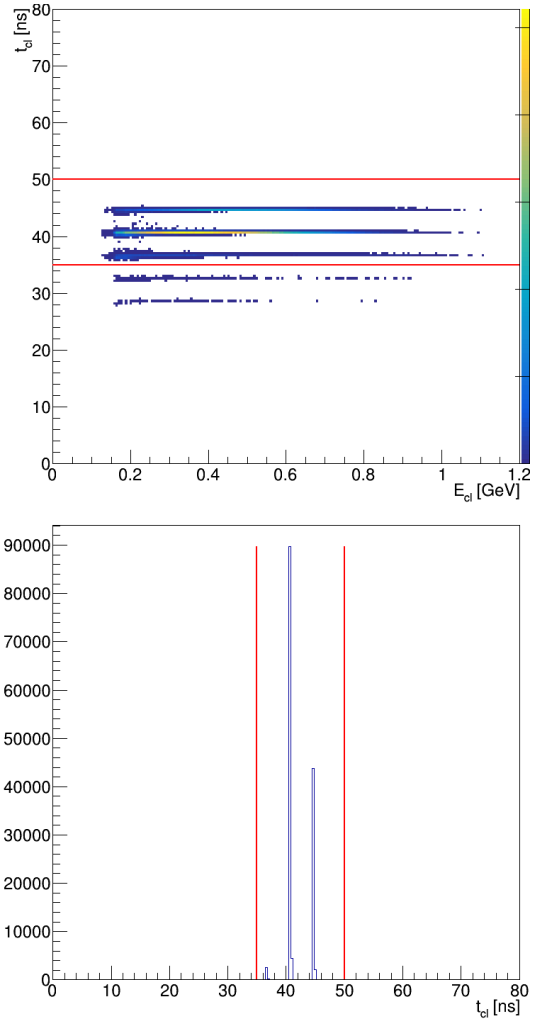
Data



Wab-Beam-Tri



WAB



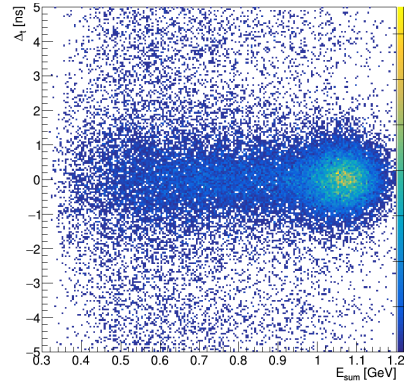
Coincidence and bgr estimation

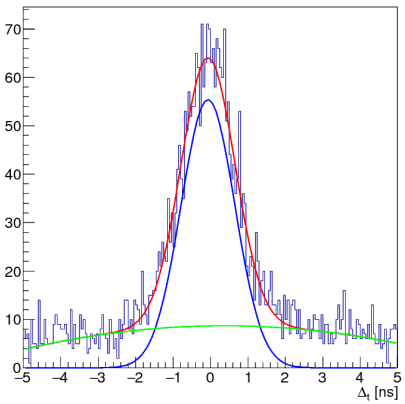
Coincidence: E_{sum} dependent 2σ cut

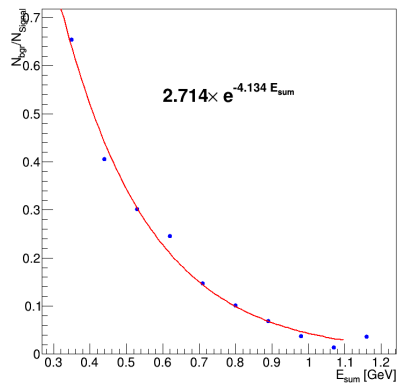
- Data bgr.: Same and neighboring bunches
- Bgr. is modeled as *Pol2*
- MC bgr.: Only Same beam bunch
- Bgr. estimated through left beam bunch

Event weight $\dfrac{1}{1+\dfrac{Bgr}{Signal}}$

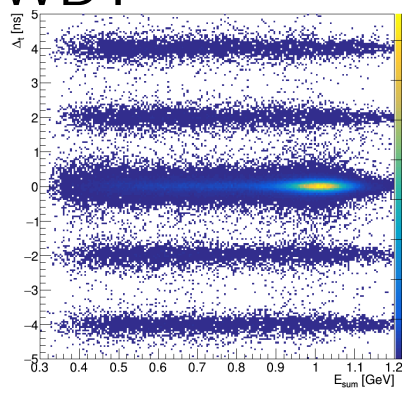
Data

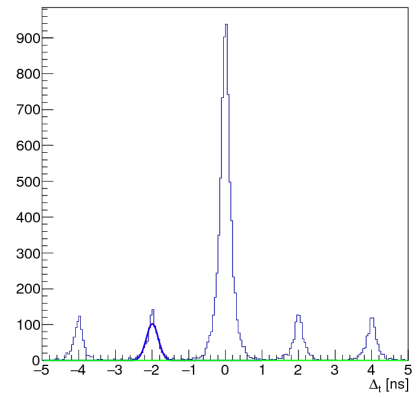


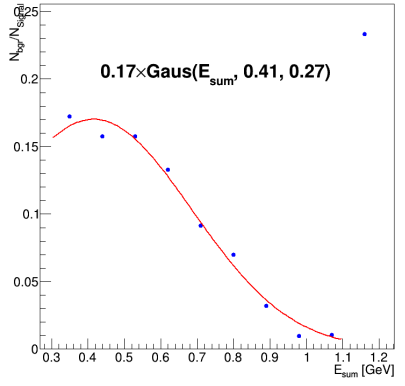




WBT

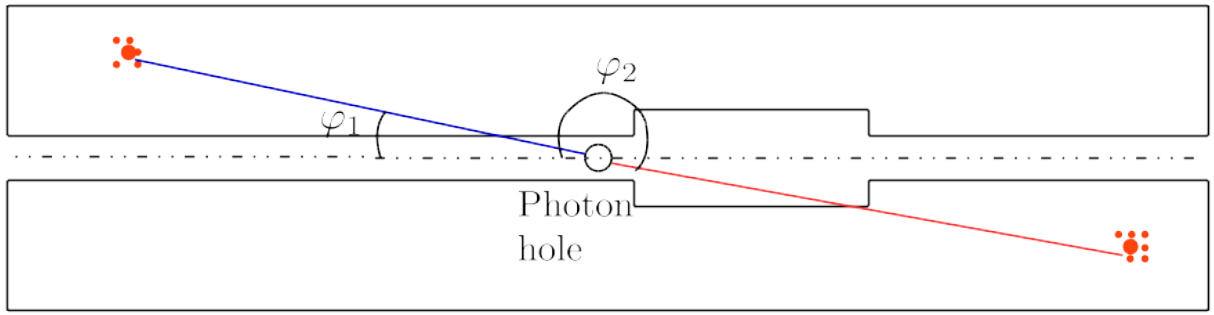




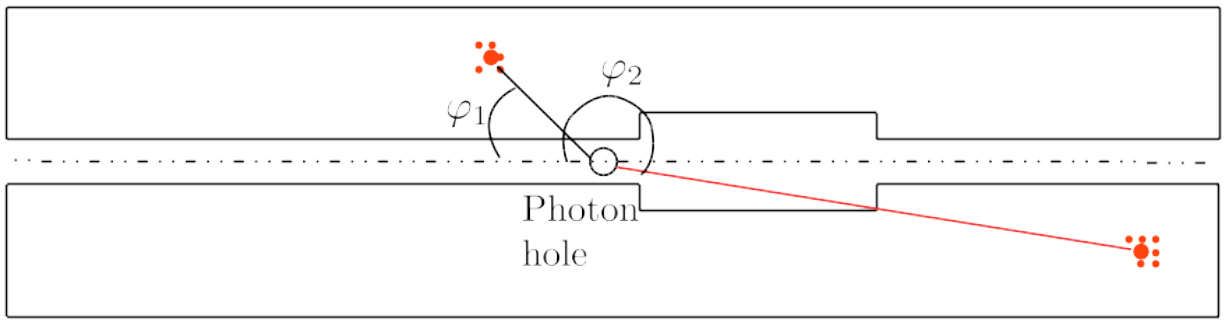


Coplanarity for different reactions

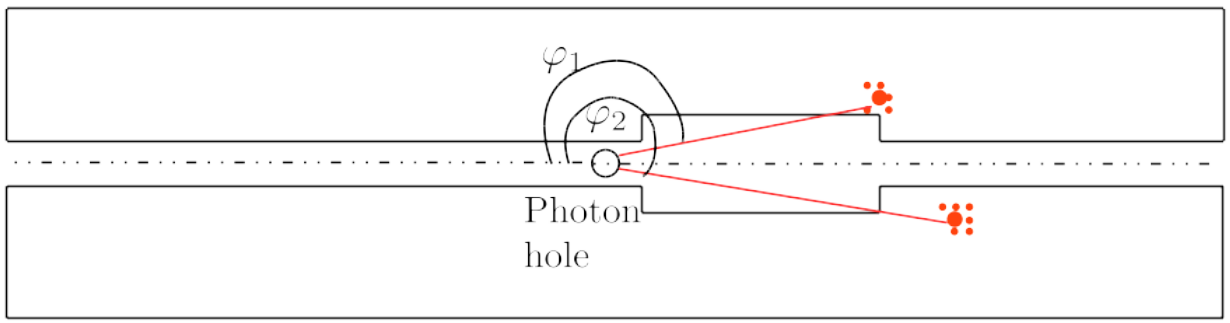
Tridents: coplanarity $\approx 180°$



WABs: coplanarity $< 180°$ but not too small



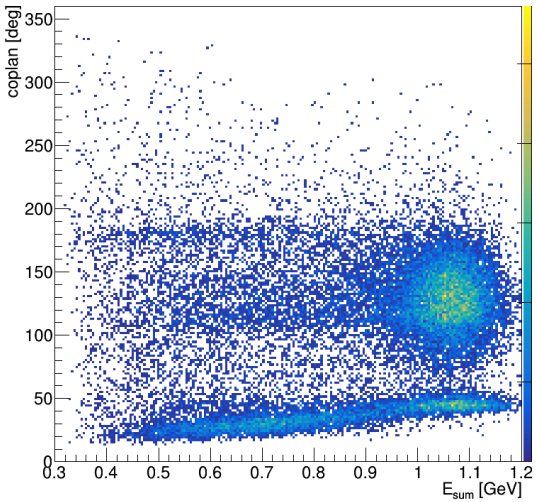
Møller events: coplanarity is small

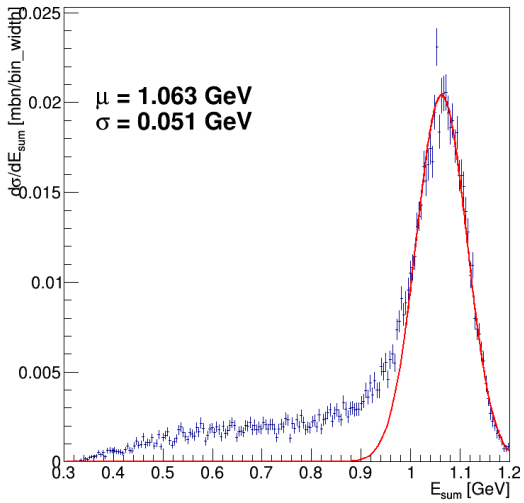


coplanarity vs E_{sum}

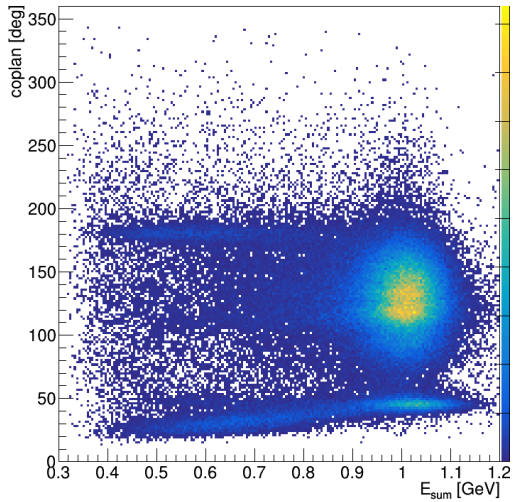
Tridents $\sim$ 180° WABs $\in (70° - 170°)$ Møller $\in (30° - 60°)$

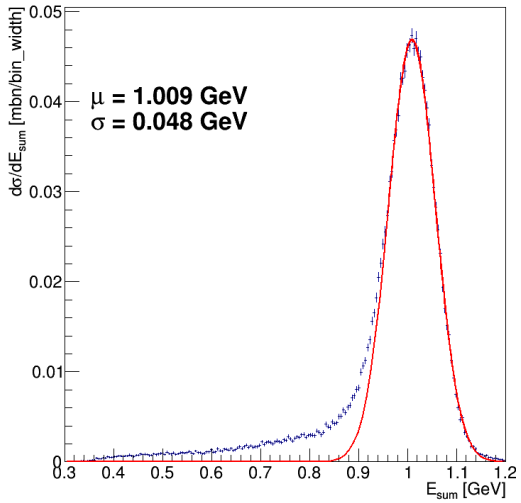
Data



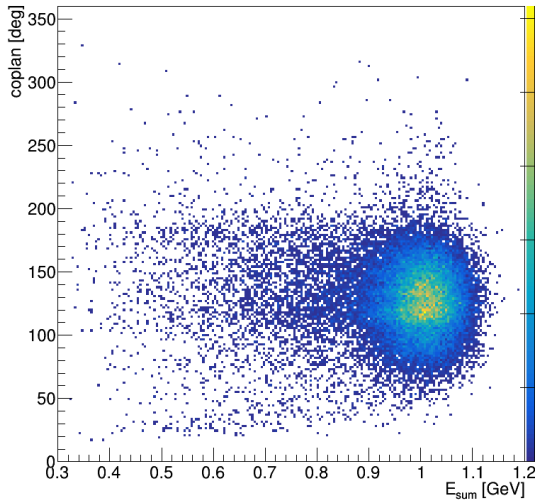


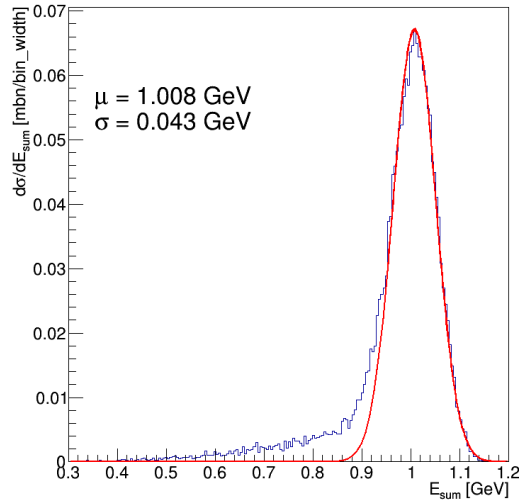
Wab-beam-tri



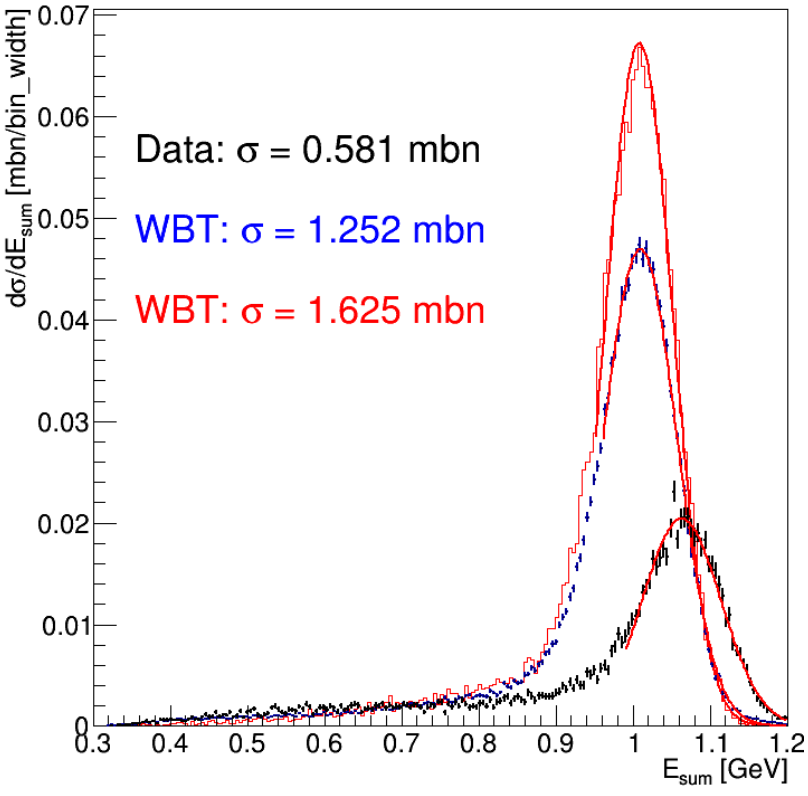


WAB





Cross sections



Normalization

- Data:
$$\frac{\text{prescale } (2^{11})}{\mathcal{L}\ (5.08 \times 10^{34}\text{cm}^{-2}) \cdot \text{lifetime } (0.85)}$$
- WBT:
$$\frac{1.}{\mathcal{L}(9.6 \text{ s@50nA}) = 7.8 \times 10^{31}\text{cm}^{-2}}$$
- Pure WAB:
$$\frac{\sigma(\text{WAB})}{N_{\text{Gen}}}$$

N_{Gen} is not correctly calculated, Number of generated events varied a lot, instead it to be fixed.

$$\frac{\text{Data}}{\text{WBT}} = 0.464 \text{ (b=0.53)}$$

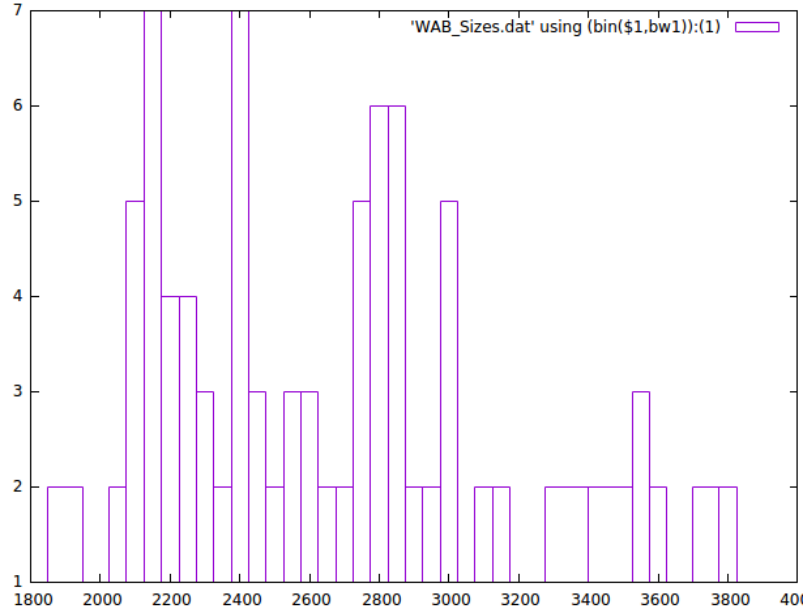
Summary

- Using ECal information only one can select WAB reaction
- Data is $\times 2$ lower than MC prediction
- Tracking efficiency is not the main responsible in Data/MC discrepancy
- Get new pure WABs generated events with a correct normalization factor

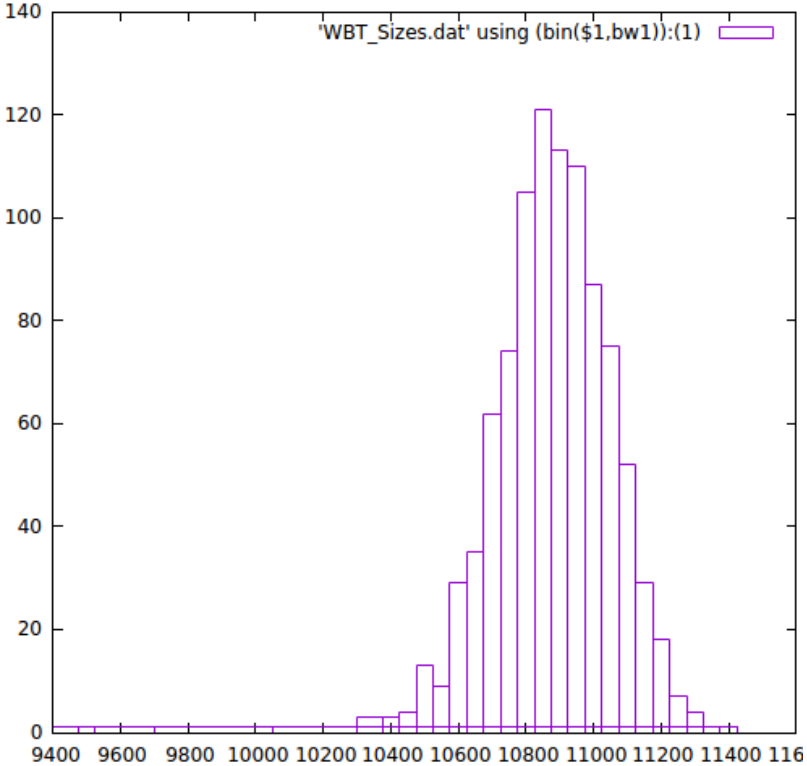
Backup

Distribution of the number of events

Pure WAB N of events



WBT N of events



Slices coplanarity