Report on KOTO EMCal Study
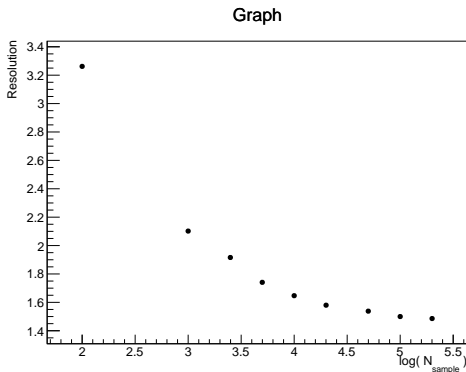
Junlee Kim

January 13, 2021

Contents

- Reconstruction as a function of the number of training samples
- Reconstruction as a function of the incident angle
- Validation check
- Reconstruction as a function of the detector width

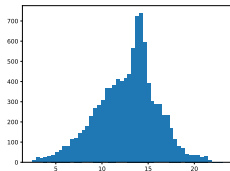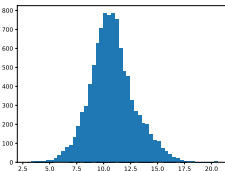# dependence on number of training samples

Graph

- ▶ Training sample: random generation for polar and azimuthal angle
- ▶ Test sample: 10k fixed $\theta = 10^o$ and $\varphi = 0^o$ events
- ▶ Resolution: standard deviation of reconstructed angle distribution
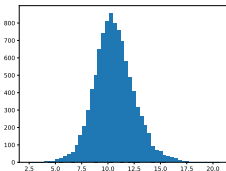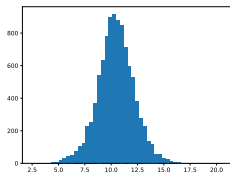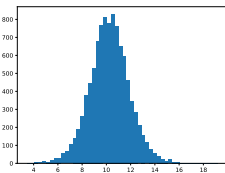
dependence on number of training samples

dependence on incident angle
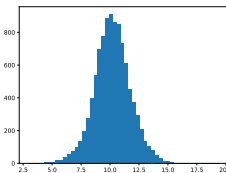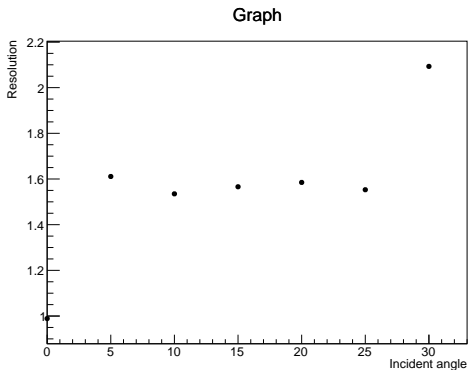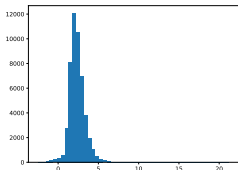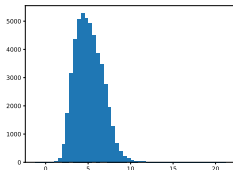

- ▶ Training sample: random generation for polar and azimuthal angle with 200k events
- ▶ Test sample: 50k fixed $\varphi = 0^o$ events.
    - ▶ $\theta = 0^o, \ 5^o, \ ... \ 30^o$.
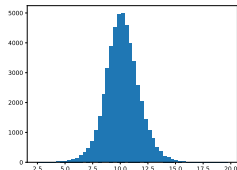- ▶ $\theta = 0^o$ and 30° are biased from training.
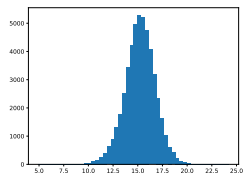
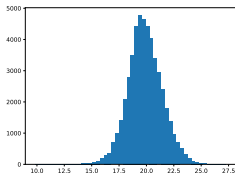# dependence on incident angle
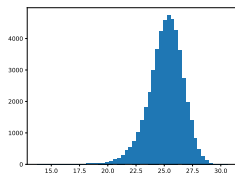

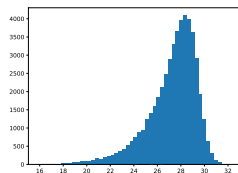$\theta = 0$
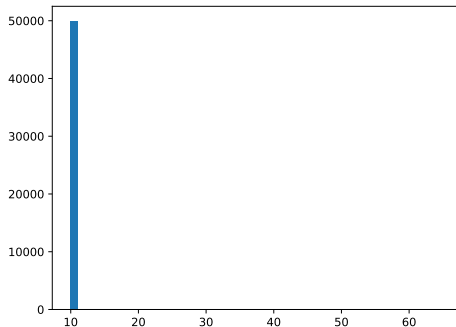
$\theta = 5$

$\theta = 10$
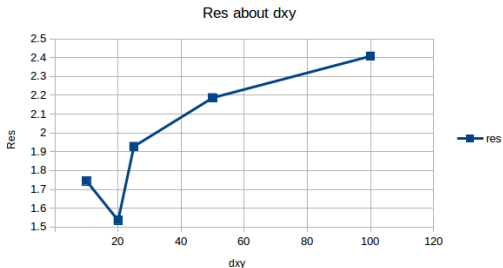
$\theta = 15$

$\theta = 20$

$\theta = 25$

$\theta = 30$

Validation check

- ▶ Training sample: 50k fixed $\theta = 10^o$ events
- ▶ Test sample: 50k fixed $\theta = 15^o$ events.
- ▶ Because all events are targeting $\theta = 10^o$ in the training, estimation of ML is always $\theta = 10^o$.
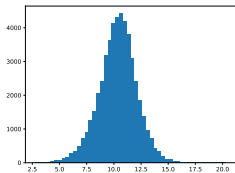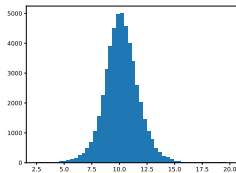
dependence on the detector width

- ▶ Training sample: random generation for polar and azimuthal angle with 200k events
- ▶ Test sample: 50k fixed $\theta = 10^o$ events.
- ▶ Width of detector from 10 mm to 100mm
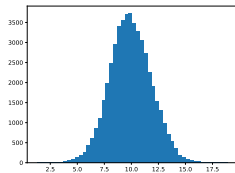- ▶ better resolution for 20 mm than 10 mm?
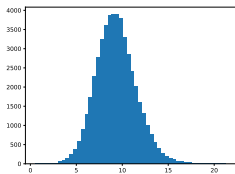
dependence on the detector width

dxy = 10 mm

dxy = 20 mm

dxy = 25 mm

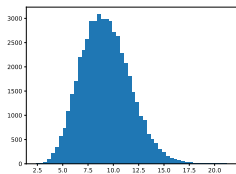dxy = 50 mm

dxy = 100 mm

status

- Two separate ML for θ_x and θ_y
- Things to be further checked?