

First hit

Vertex fit

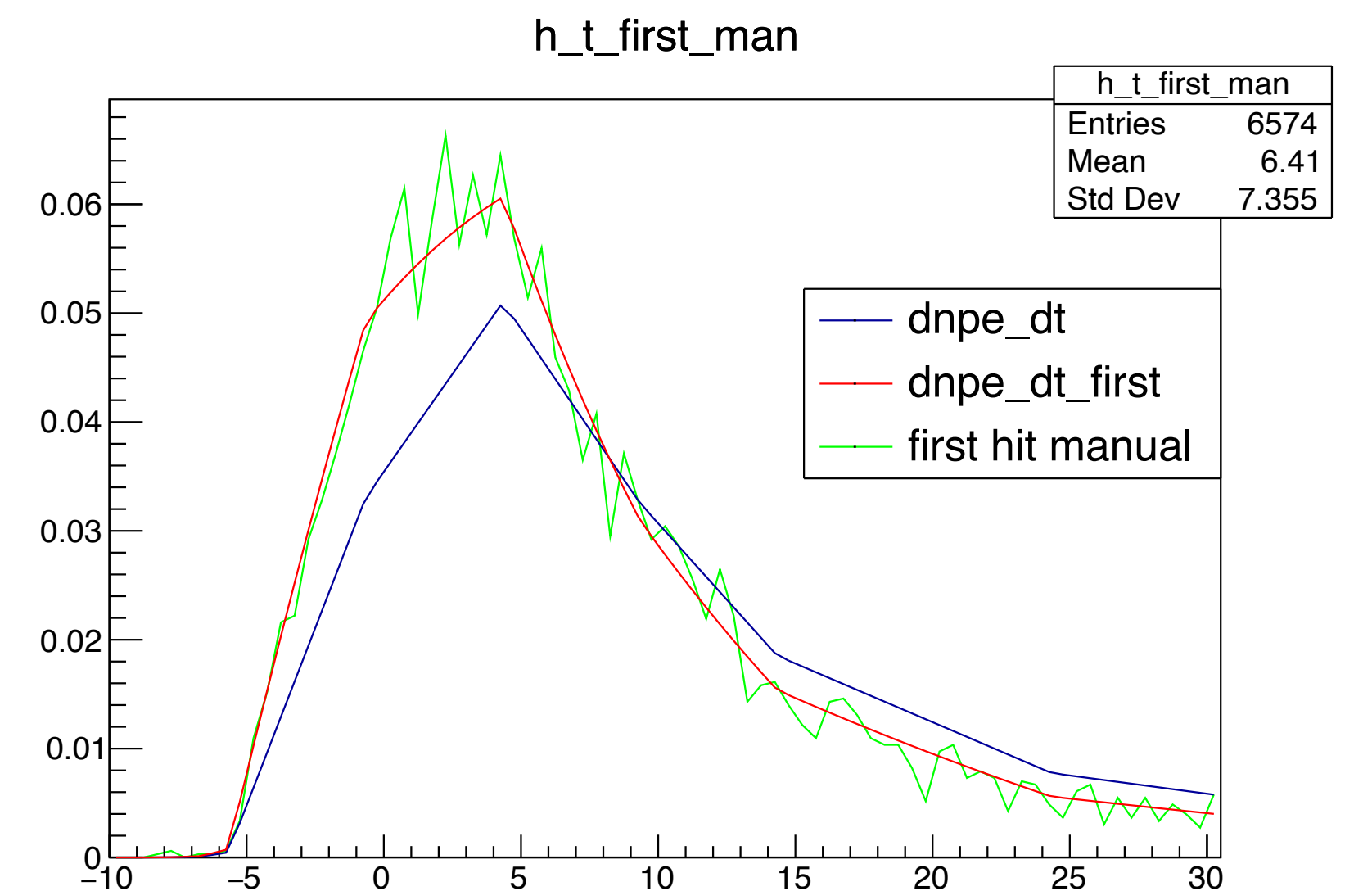
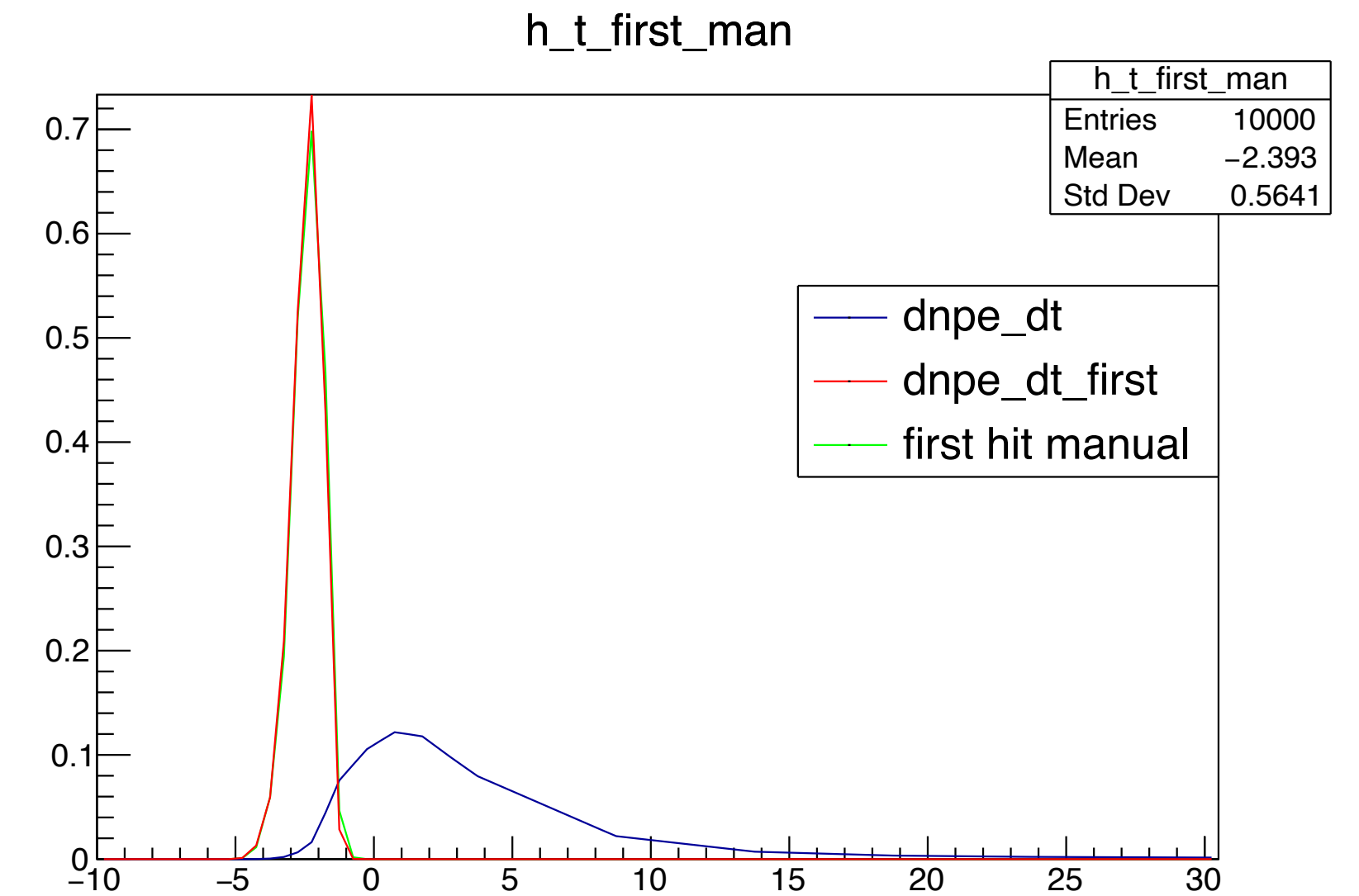
Thijs van Eeden - 23th July 2020

First hit

- PDF for first hit at time t:

$$\frac{dn_{pe}}{dt} \frac{1}{\int \frac{dn_{pe}}{dt} dt} \exp(-\mu)$$

- Depends strongly on distance!



First hit

- Generate ~2800 hits on ~600 PMTs using all time PDF
- Both 2800 and ~600 first hits used for reconstruction
- Reconstructed using normal PDF and first hit PDF

No shower elongation, 100 pseudo experiments

—> 4 resolutions for the shower vertex position

Perpendicular distance to shower

	Use all hits	Use only 1st hits
Normal PDF for reco	3.7 ± 2.1 cm	18.1 ± 4.9 cm
1st hit PDF for reco	160.7 ± 7.2 cm	5.7 ± 2.6 cm

Error from
the likelihood:
~5-7 cm

Next

- Do the same for shower elongation
 - What are the resolutions?
- What do you lose if you have elongated showers don't use that in reconstruction?
And vice versa?

Longitudinal distance to shower

	Use all hits	Use only 1st hits
Normal PDF for reco	$5.2 \pm 1.8 \text{ cm}$	$63.2 \pm 4.1 \text{ cm}$
1st hit PDF for reco	$109.2 \pm 2.6 \text{ cm}$	$2.2 \pm 1.6 \text{ cm}$

Error from
the likelihood:
~5-7 cm