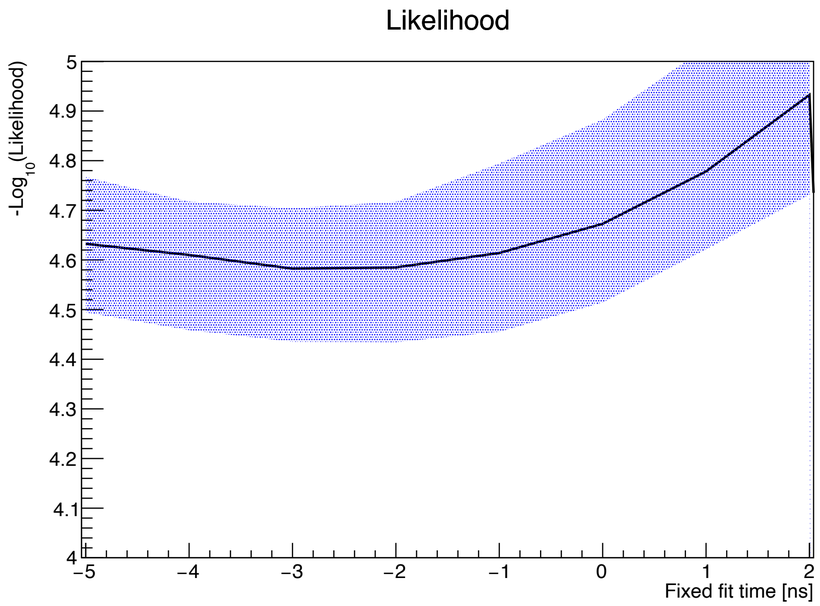
Vertex fit

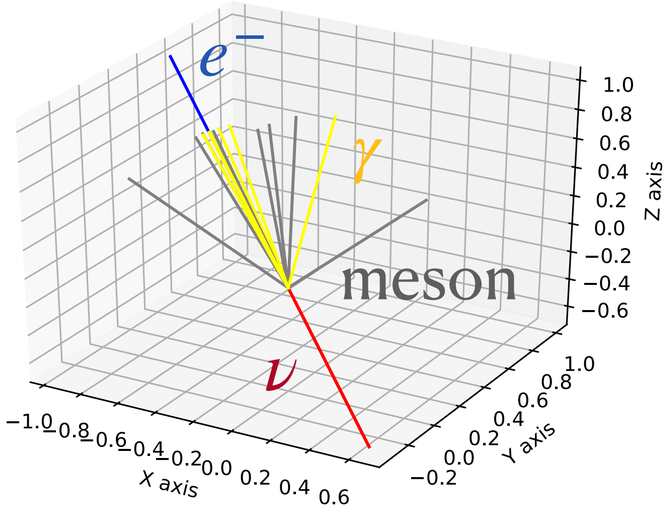
Thijs van Eeden - 2020-11-05

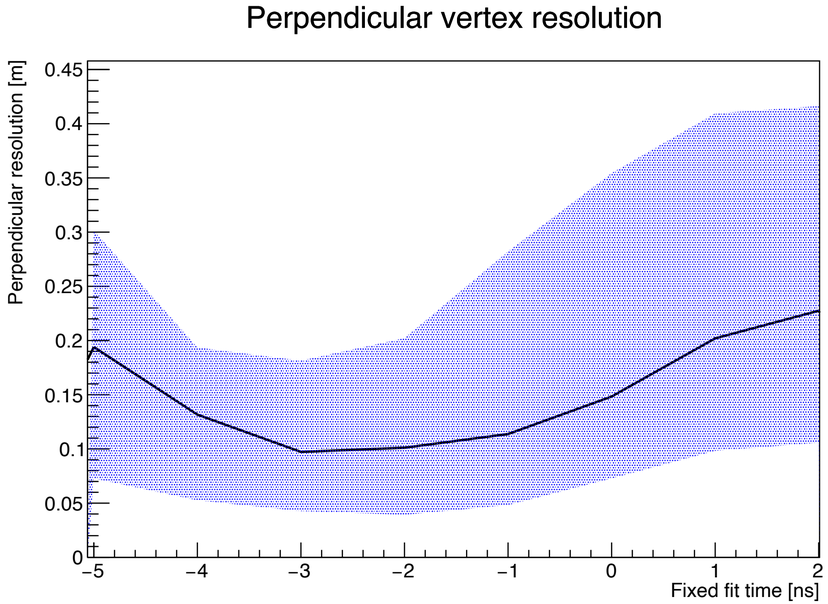
Recap

- Likelihood prefers slight negative event times
- Perpendicular vertex resolution optimal for slightly negative times



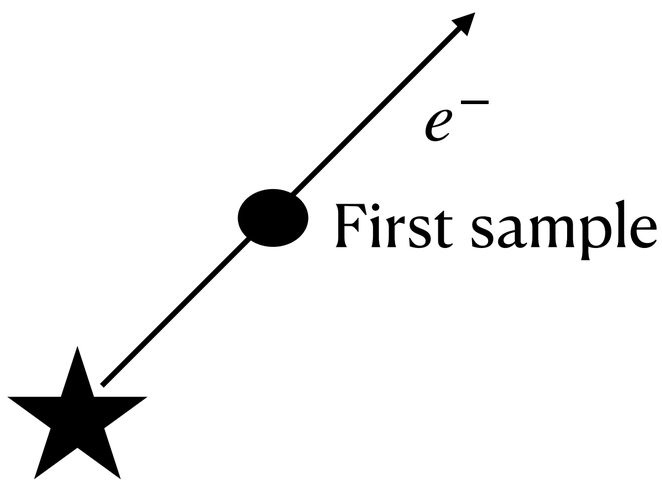
Hint:





Current status: Elongation

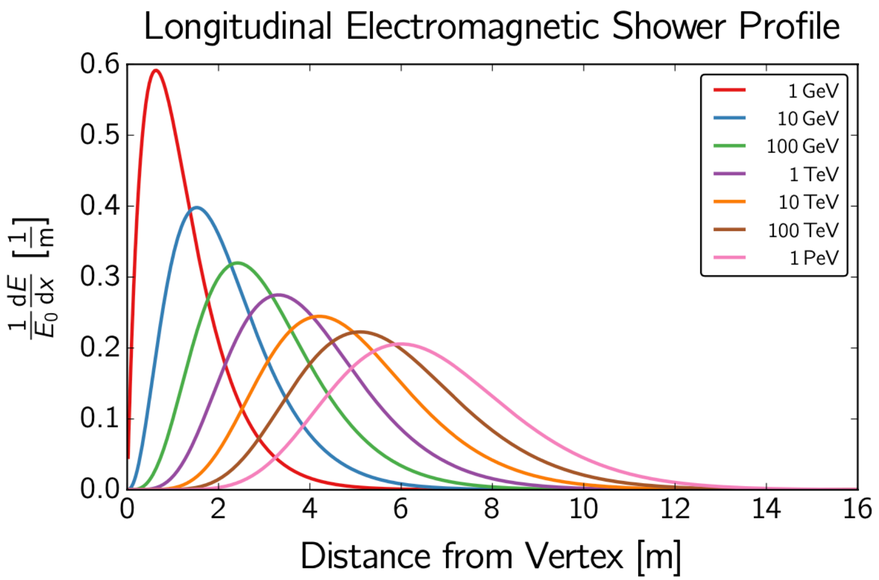
5 steps, 100 TeV shower



- PDF sampled along shower axis where ϵ = [0.1, 0.3, 0.5, 0.7, 0.9] of light is emitted
- Contributions weighted with 1/5
- This corresponds to dz = [2.9, 3.9, 4.7, 5.6, 7.0] m

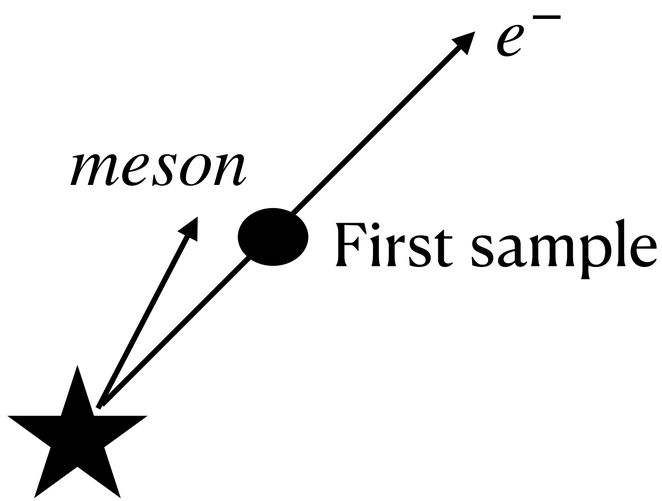
No light emitted before 2.9 meter!

What if there is a lower energy particle?



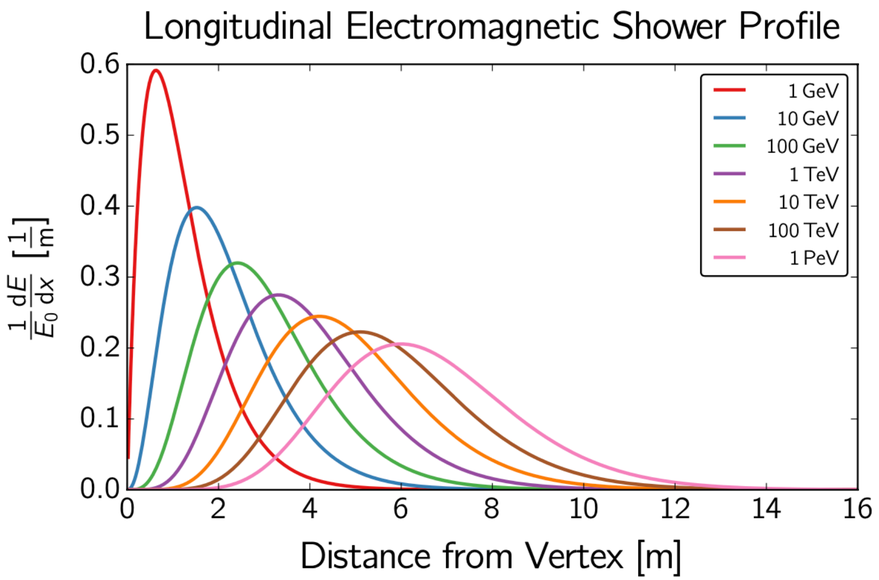
Current status: Elongation

5 steps, 100 TeV shower



What if there is a lower energy particle?

- Produces light in a region before the first PDF sample
- Produces an *impossible* hit with the 100 TeV shower hypothesis
- Fit moves vertex to a place and time to make this probability >0



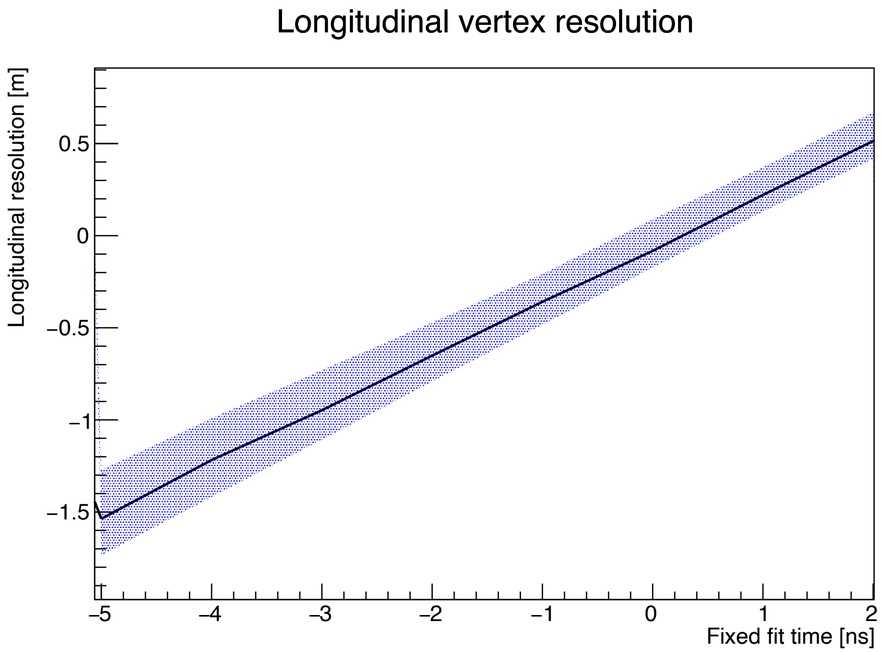
Solution: add extra sampling step at $\epsilon = 0.001$,

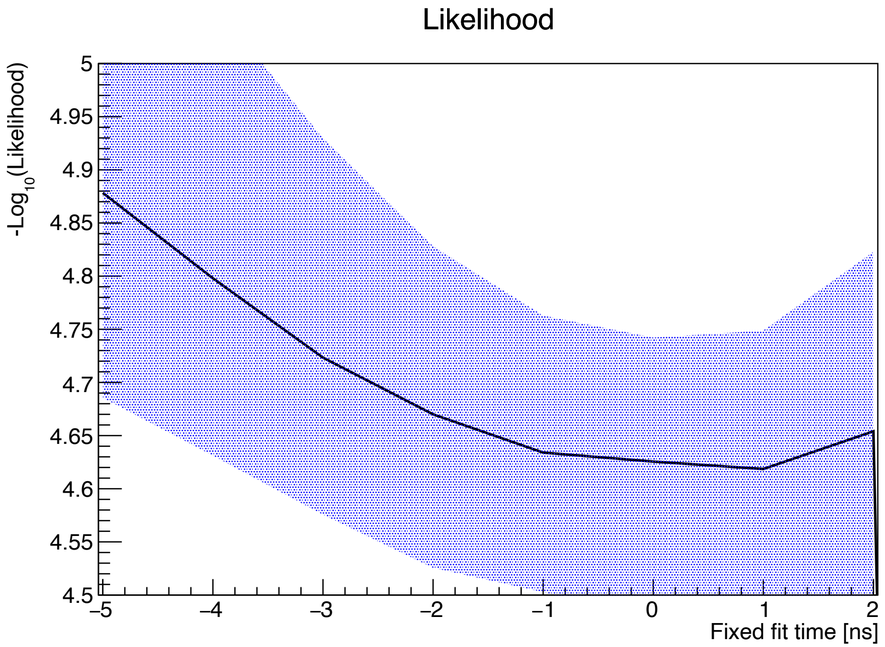
weight = $\epsilon = 0.001$ at dz = 1.3 m

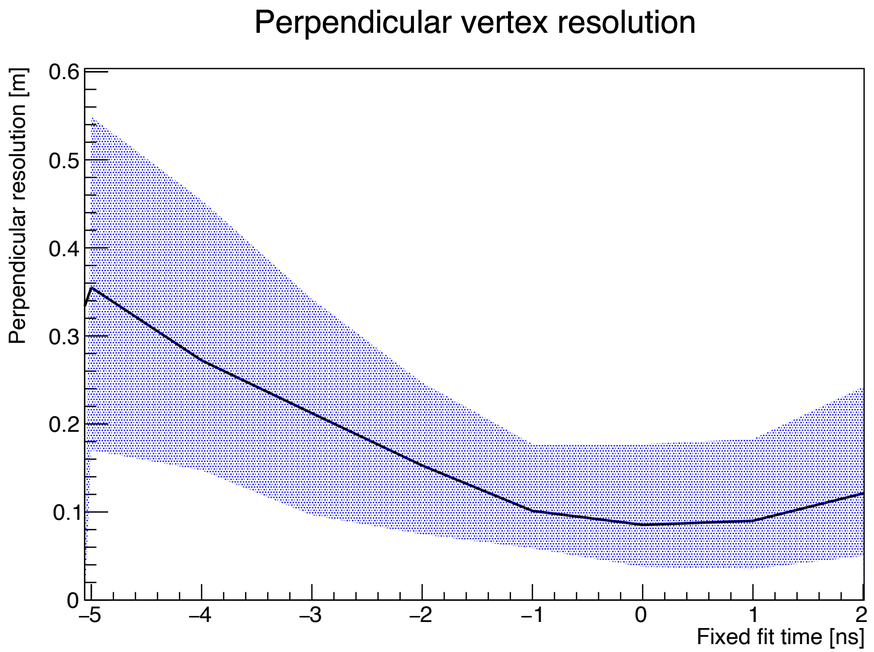
Current status: Elongation

Extra sampling step at $\epsilon = 0.001$

Likelihood and resolution now optimal at t = 0 (true event time)







Conclusion

- Early hits close to the vertex gave problems in the vertex resolutions
- Problem now solved by sampling steps closer to the vertex

Outlook

- Optimise early sampling steps
- Create benchmark resolutions
- Continue with tau simulation and reconstruction