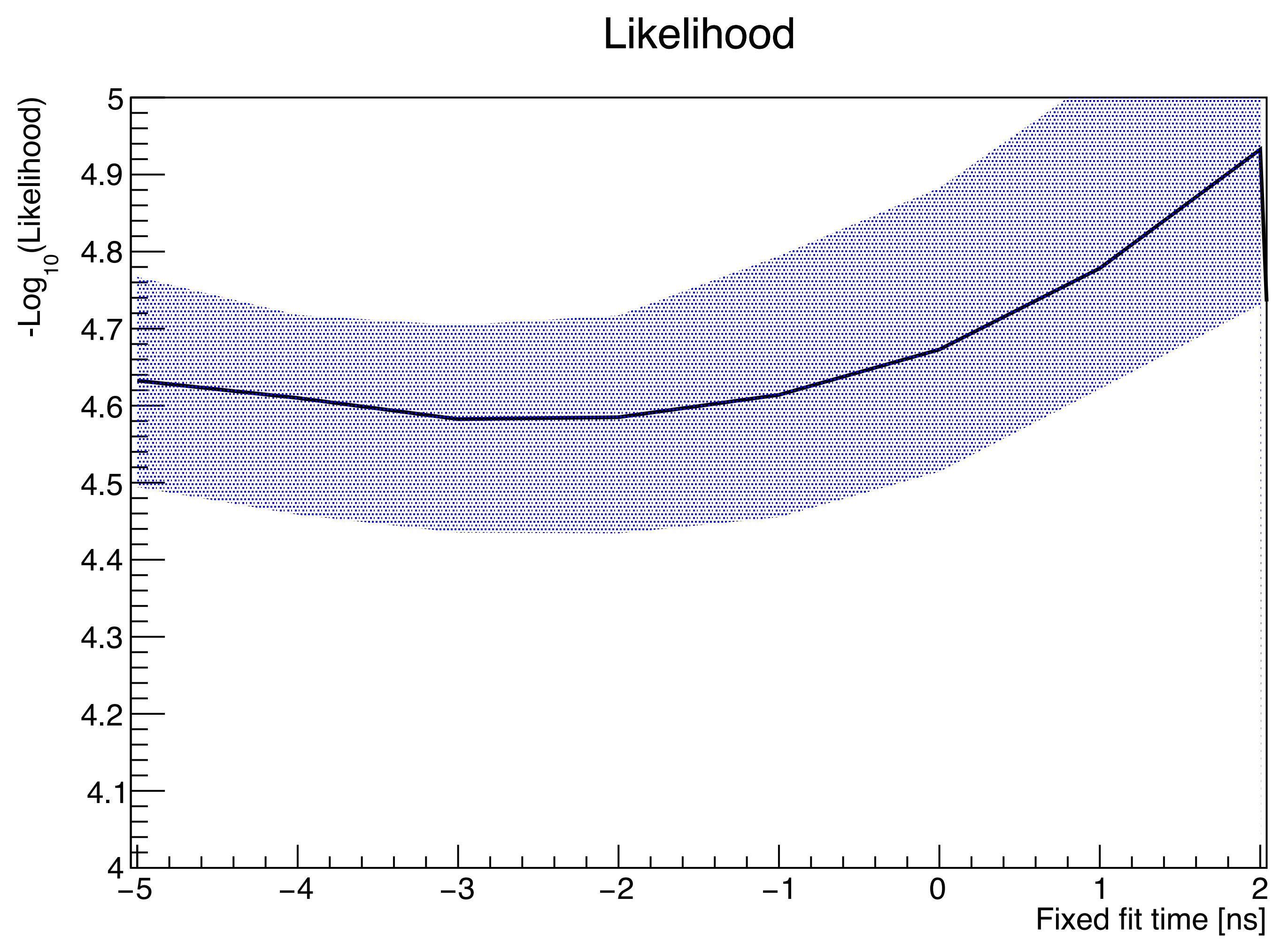
Vertex fit

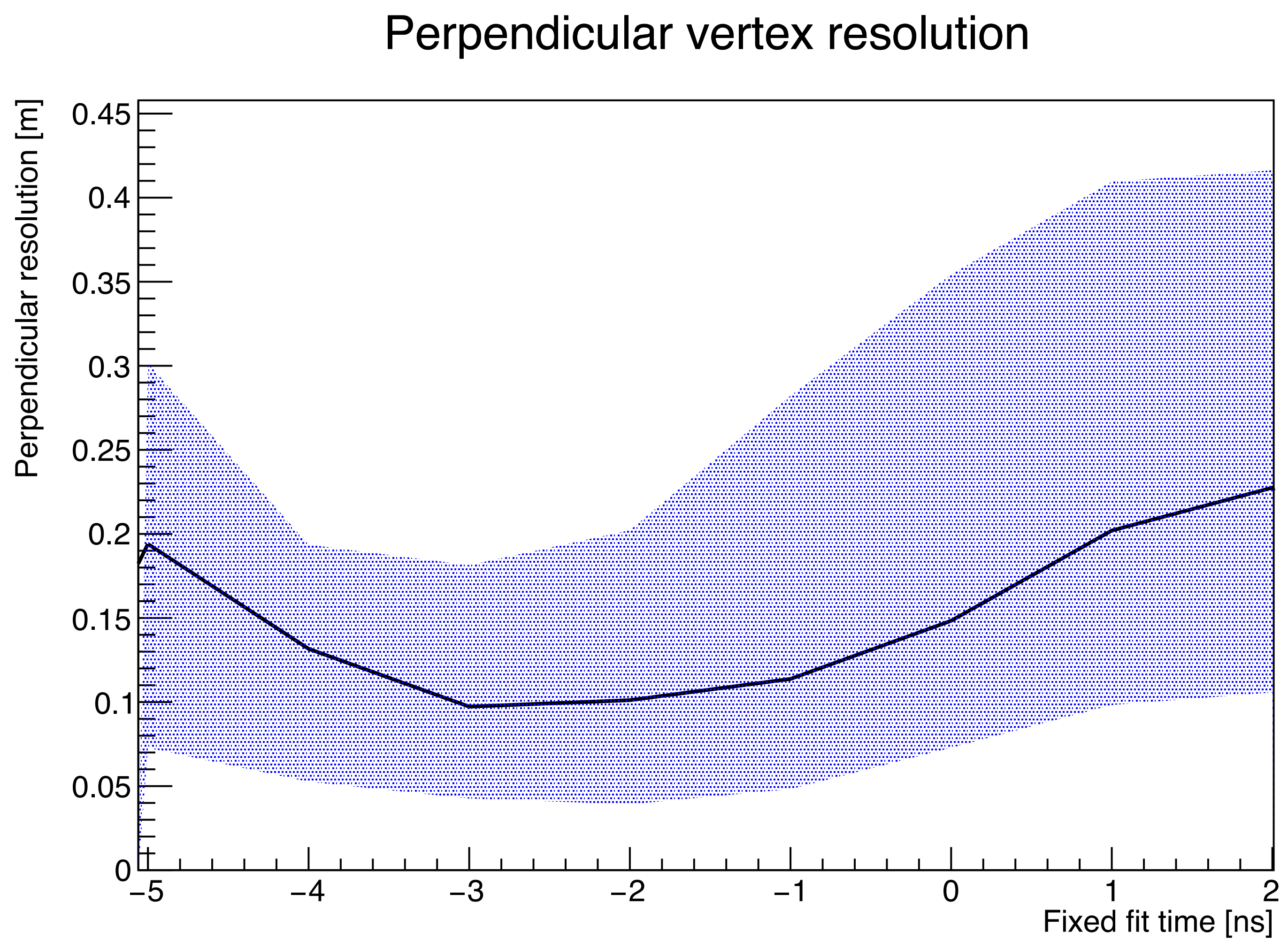
Elongation study

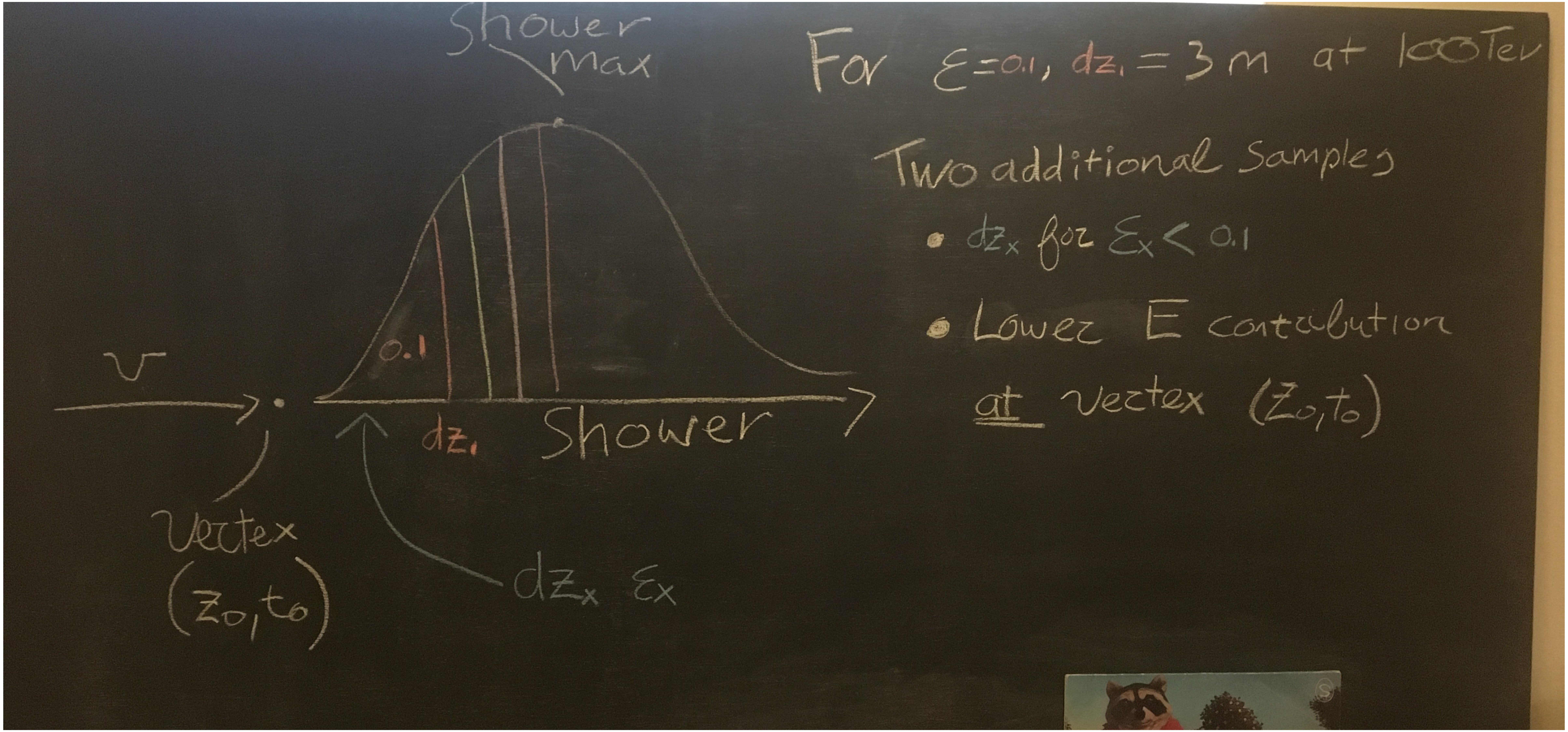
2020-11-13 - Thijs van Eeden

Recap

- 100 TeV shower events
- Every event is reconstructed with different starting times
- Vertex reconstructed using MC hits






Shower max
For ε=0.1, dz₁ = 3 m at 100TeV
Two additional samples
• dzₓ for εₓ < 0.1
• Lower E contribution
at vertex (z₀,t₀)
0.1
ν
dz₁
Shower
Vertex
(z₀,t₀)
dzₓ εₓ

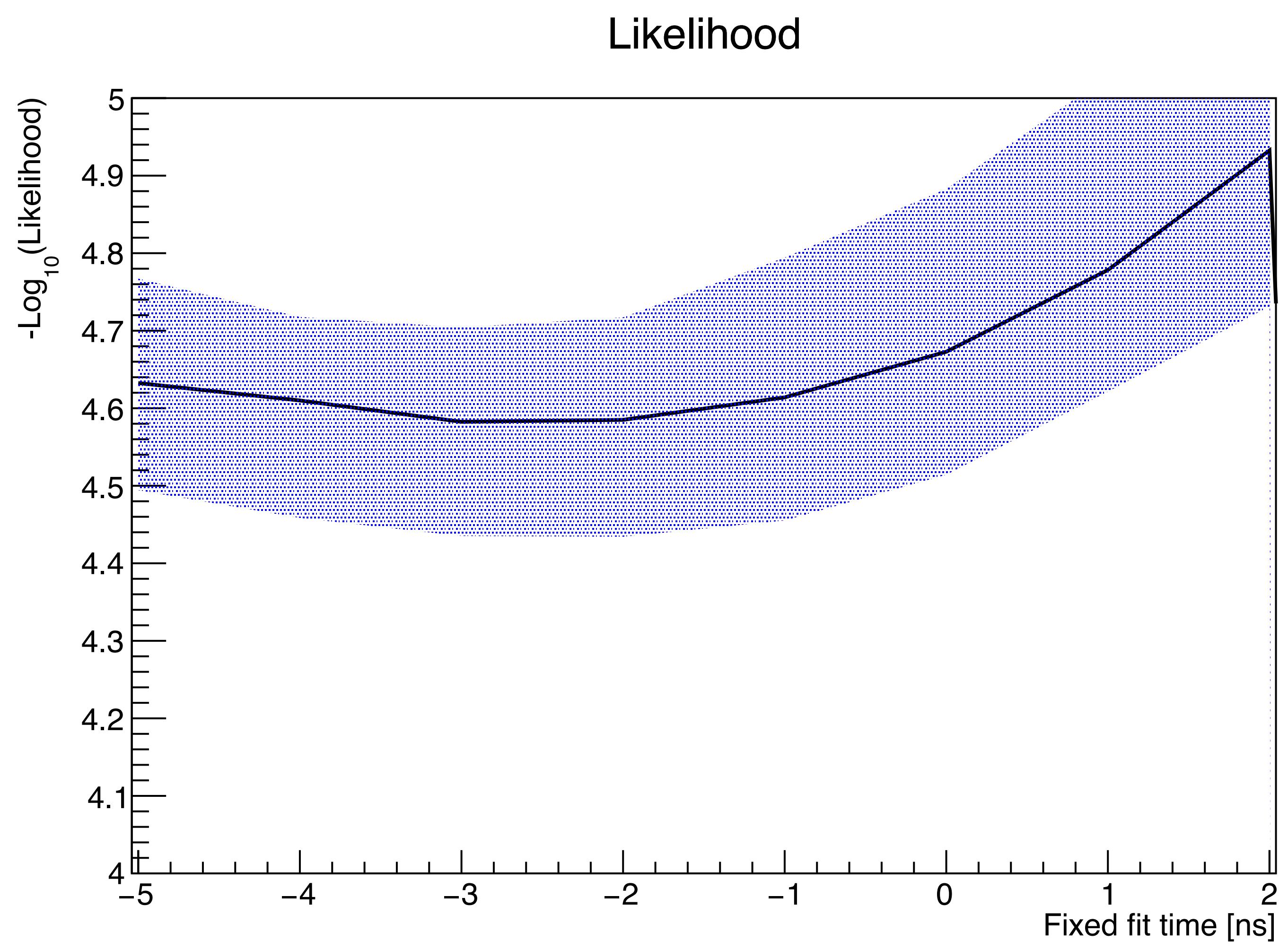
Elongation improvement

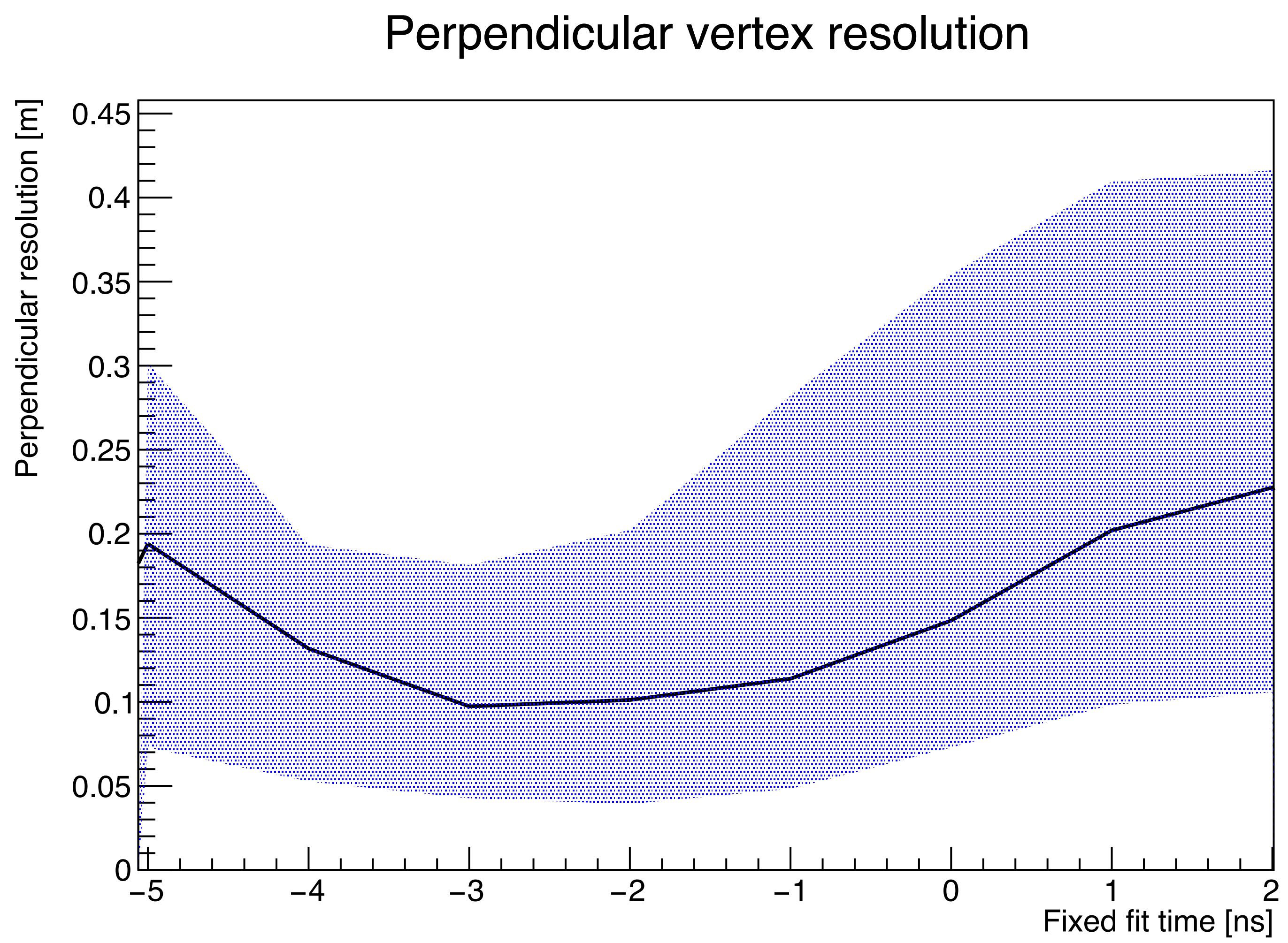
Reconstruct the same 100 events for different:

- **Energy fractions** of contribution at vertex
- **Sampling fractions** between vertex and 1st 10% sampling point

What happens to the

- Bias of the resolution
- The minimum -log(Lik)
- The time at which they are optimal



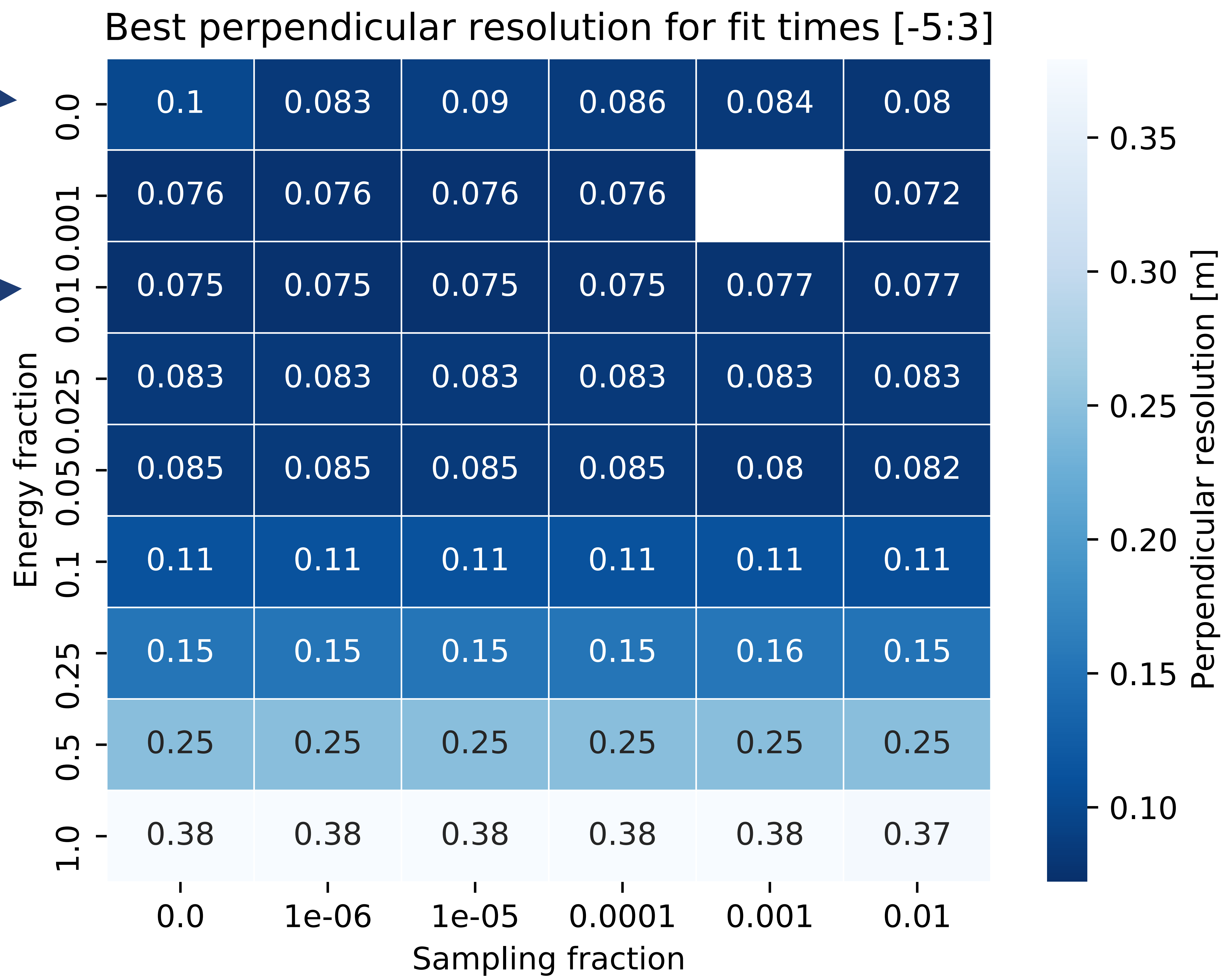


Perpendicular bias

No extra sampling (like before)

Optimal bias for Energy fraction 0.01 (gives 7.5 cm)

At what fitted time is the bias Optimal?

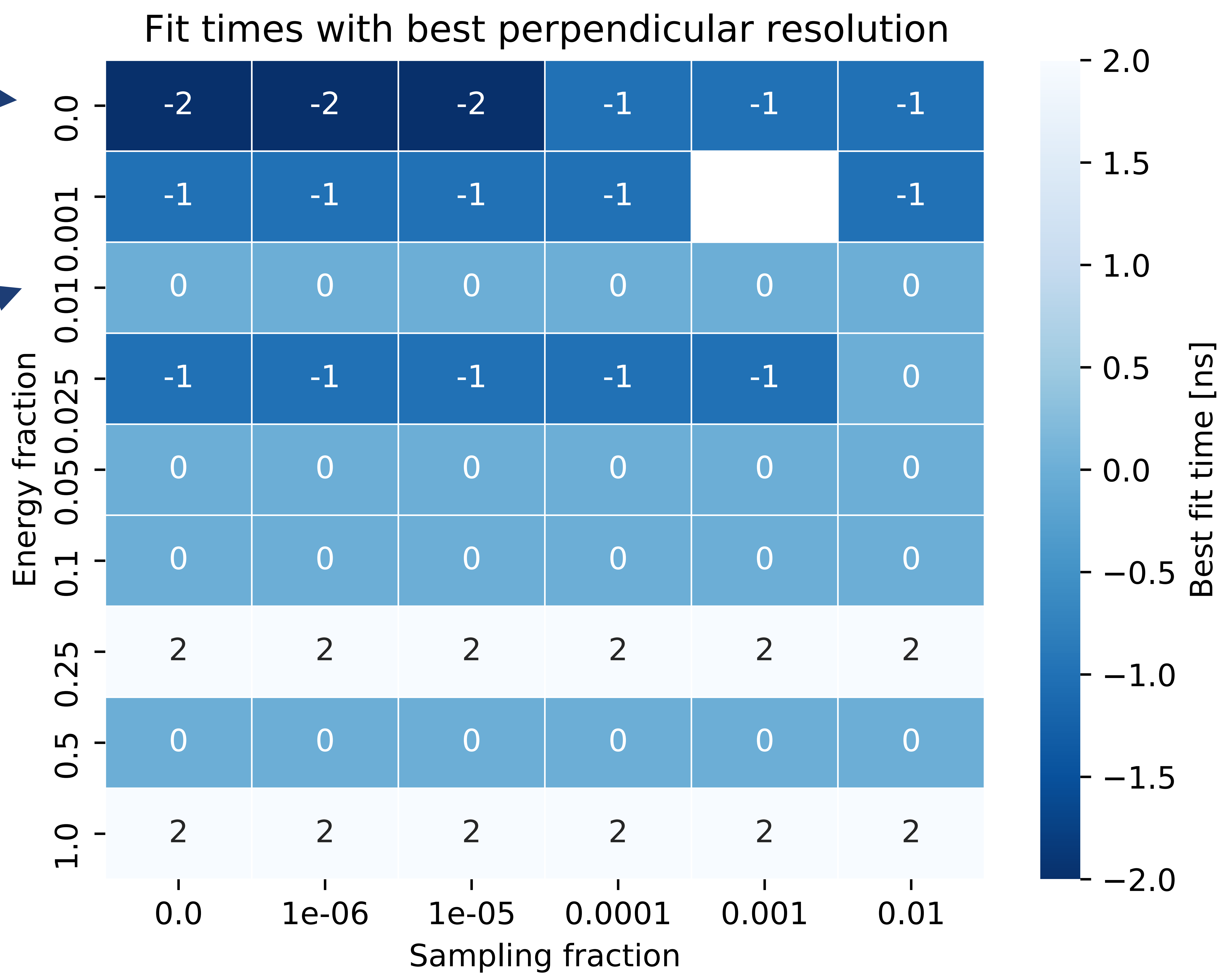


Fitted time

No extra sampling (like before)
Best bias found at negative times

Optimum in perpendicular bias
found at fitted time = 0

What happens to the likelihood?

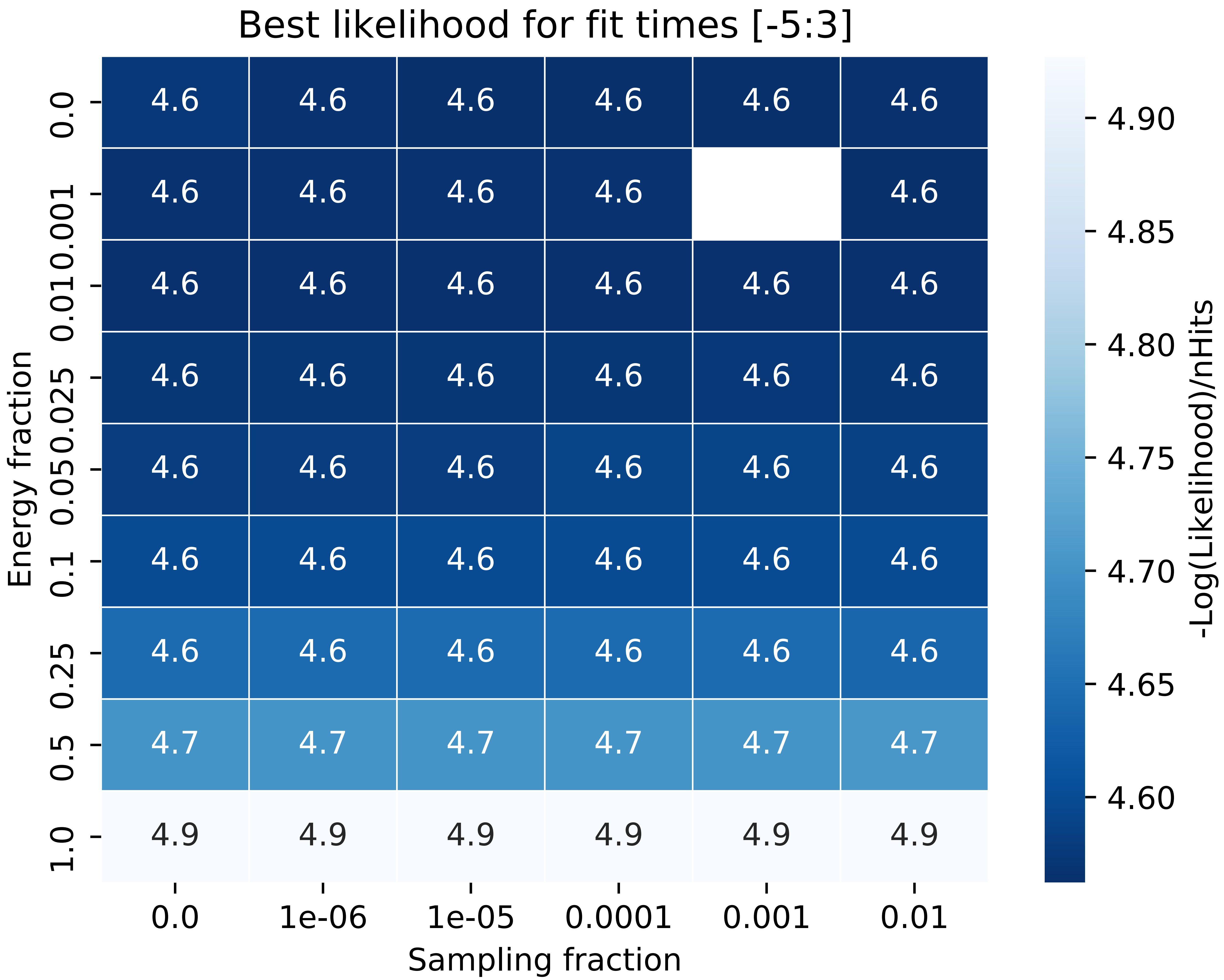


Likelihood

-log(Likelihood) / len(hits) is comparable for all experiments

At which fitted time is the

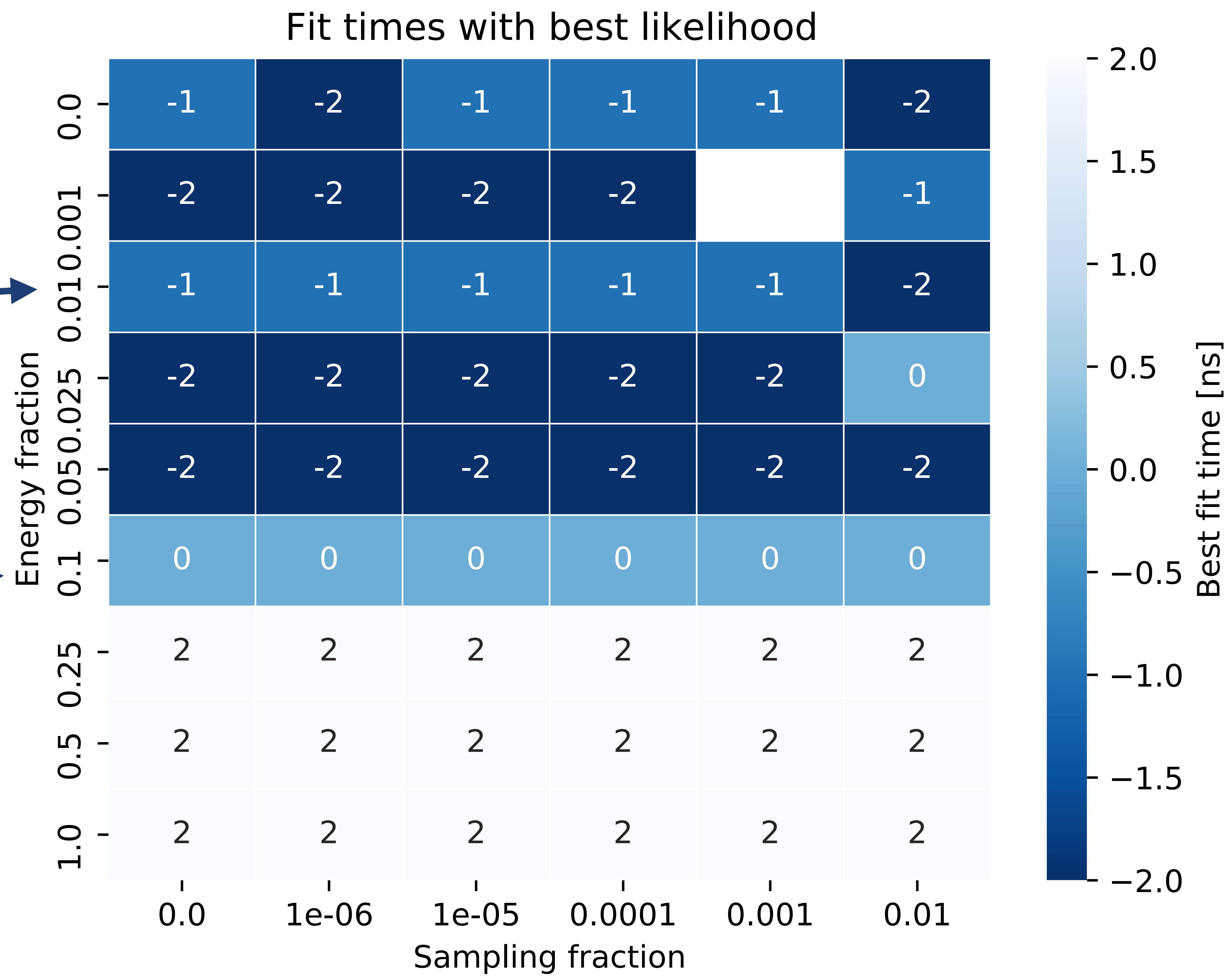
-log(Likelihood) at a minimum?



Fitted time

Optimum in likelihood with best found at fitted time = -1

Row where likelihoods are optimal at t =0 had a resolution of 11 cm instead of 7.5 cm



Conclusion

- Optimum in perpendicular bias when putting contribution with 1% of the energy at the vertex, found at true event time
- No extra sampling necessary
- BUT: likelihood is at a minimum at t = -1, so fit will pull to t = -1

Real hits problem