Belle Starr Status Update

Robert Bormuth
Leiden University and Nikhef
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Scan results - Ideal case

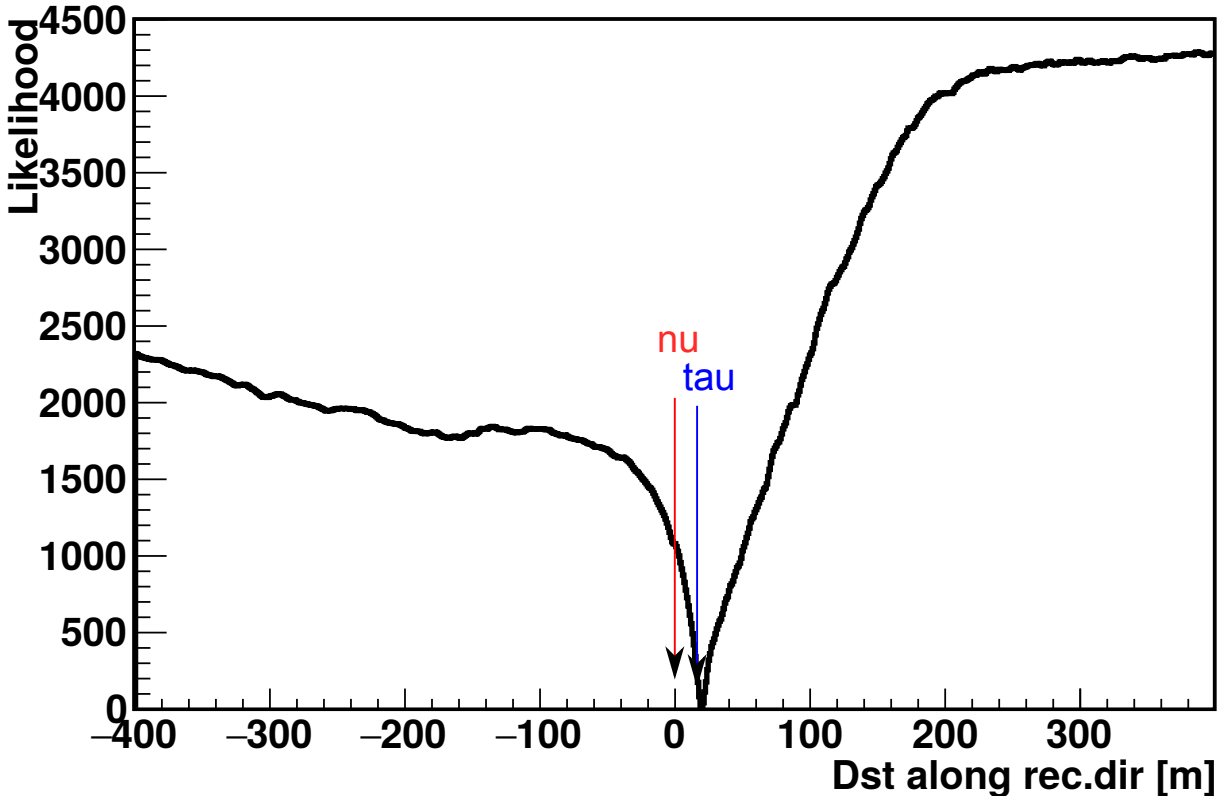


Figure : Two shower likelihood evaluated every meter along the rec direction; 0 is the prefit position; sim length 17 m tau visible energy fraction 0.93

Scan results - landed at tau decay

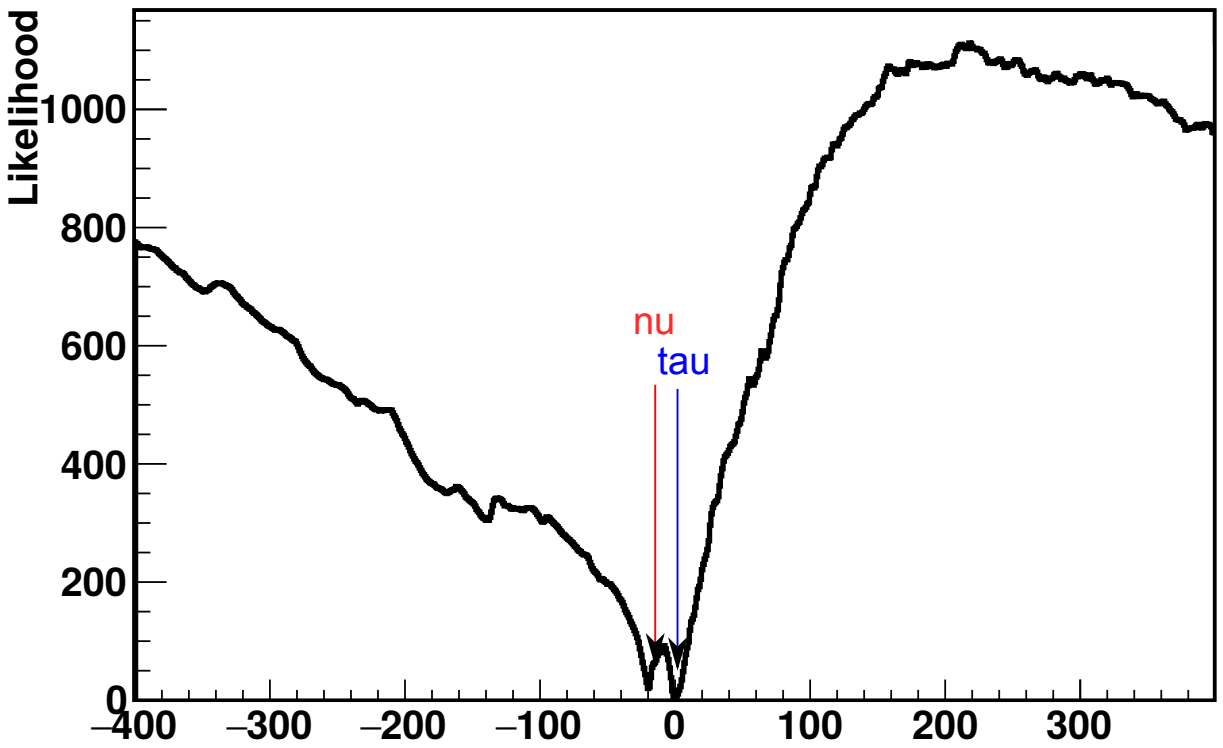


Figure : Two shower likelihood evaluated every meter along the rec direction; 0 is the prefit position; sim length 10 m tau visible energy fraction 0.99

Scan results - landed at tau decay

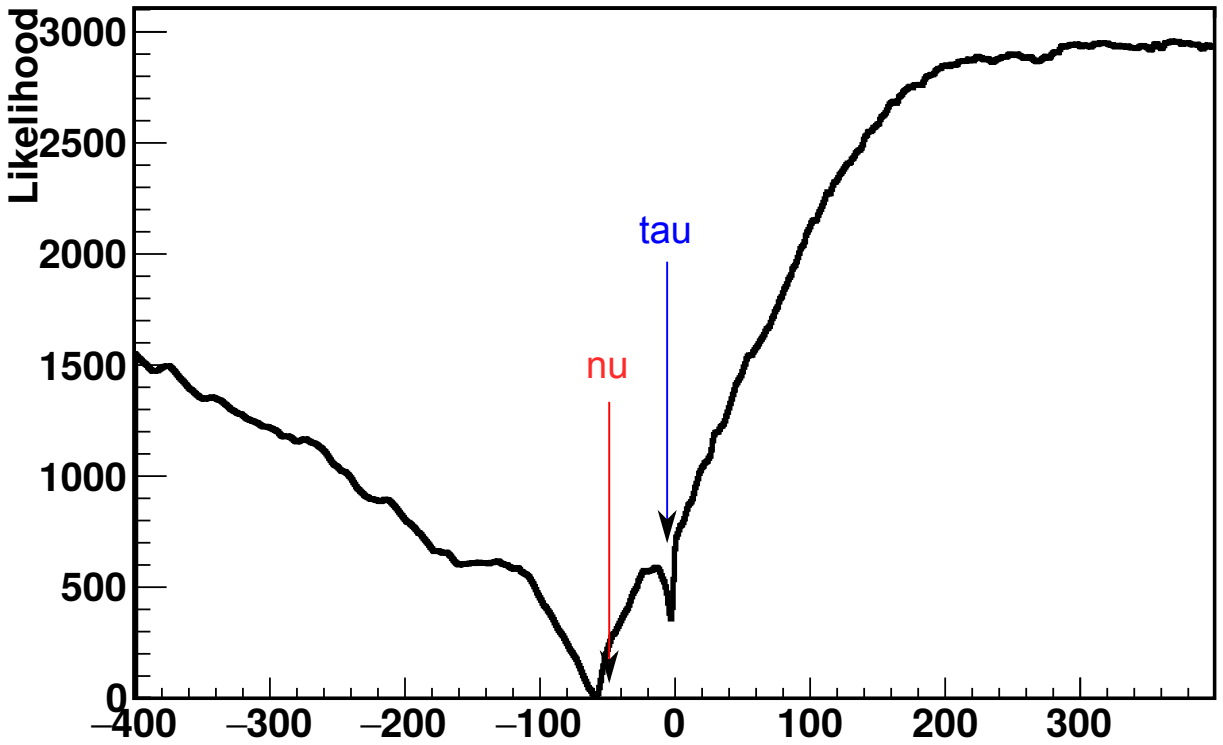


Figure : Two shower likelihood evaluated every meter along the rec direction; 0 is the prefit position; sim length 56 m tau visible energy fraction 0.94

Scan summary

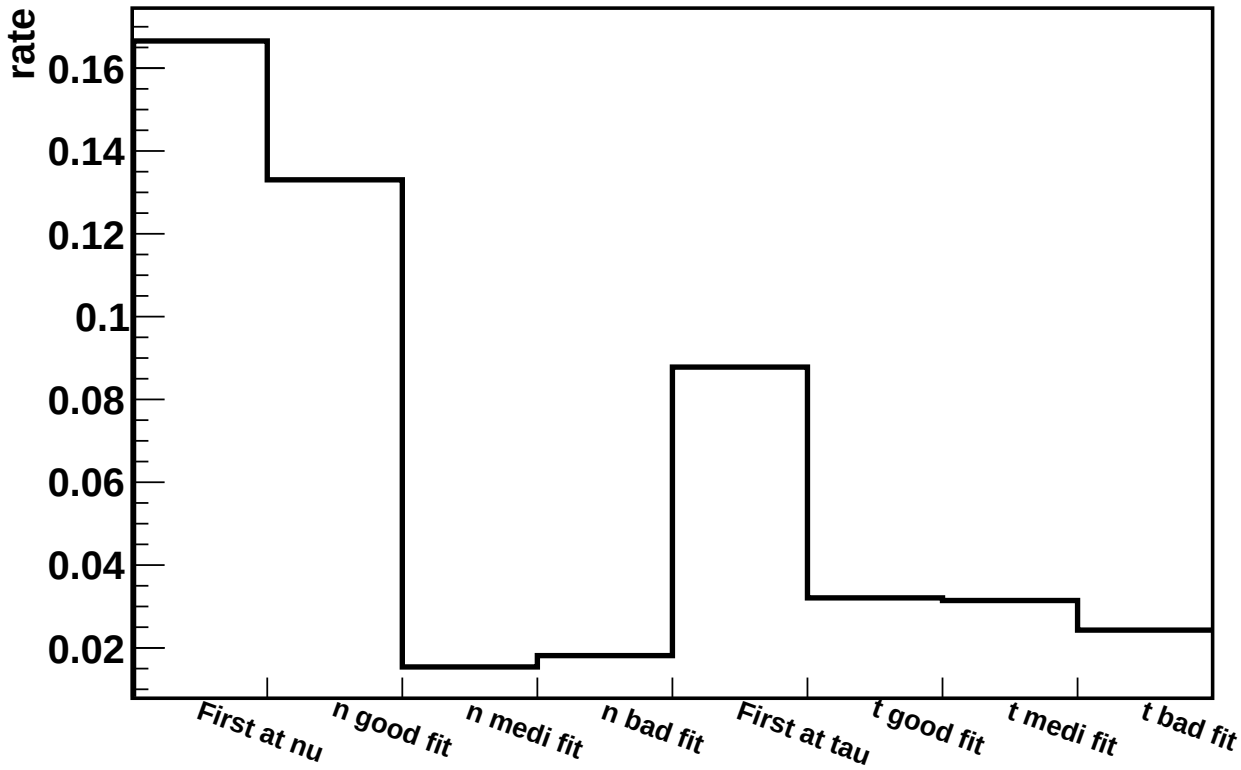


Figure : Summary of the result of taking the minimum in scan as second shower; good are events with distance resolution within 5 m, medi are events with the second vertex at the same position as the first and the rest is classified as bad

Likelihood scan with length greater 10 m nueCC

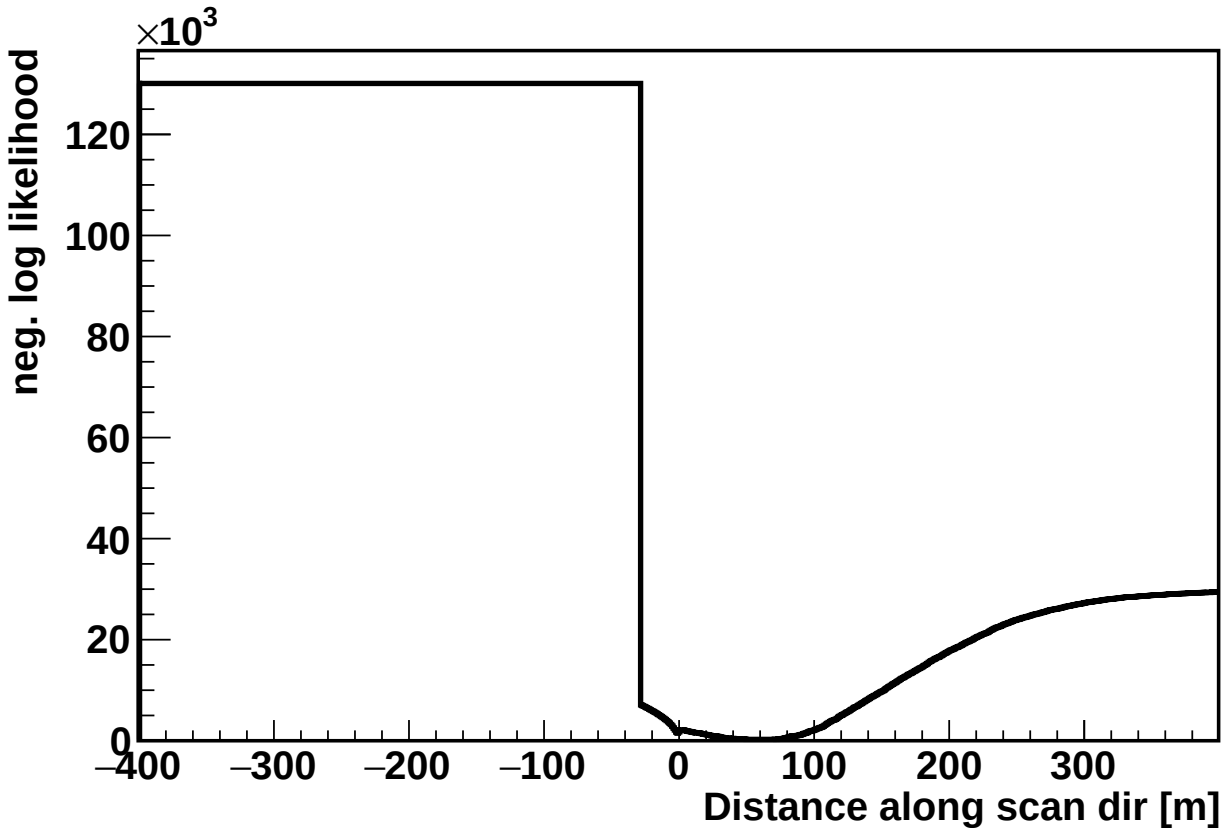


Figure : Two shower likelihood evaluated every meter along the rec direction; 0 is the prefit position; neutrino energy greater 10 PeV; **nueCC**

Likelihood scan with length greater 10 m nueCC - merge hits

At the highest energies merging the hits within 500 ns solves these issues - due to PMT simulation or just too many late hits for simple pdf used?

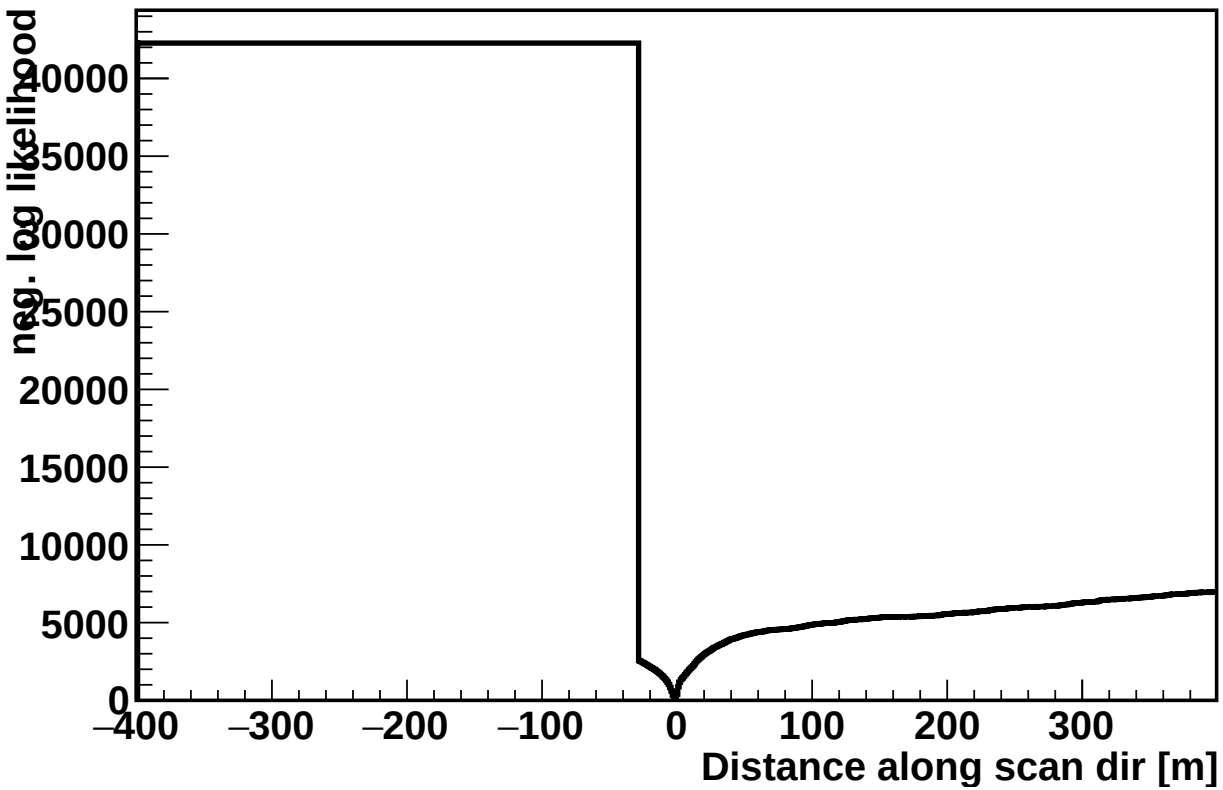


Figure : Two shower likelihood evaluated every meter along the rec

Likelihood scan with length greater 10 m for numuCC

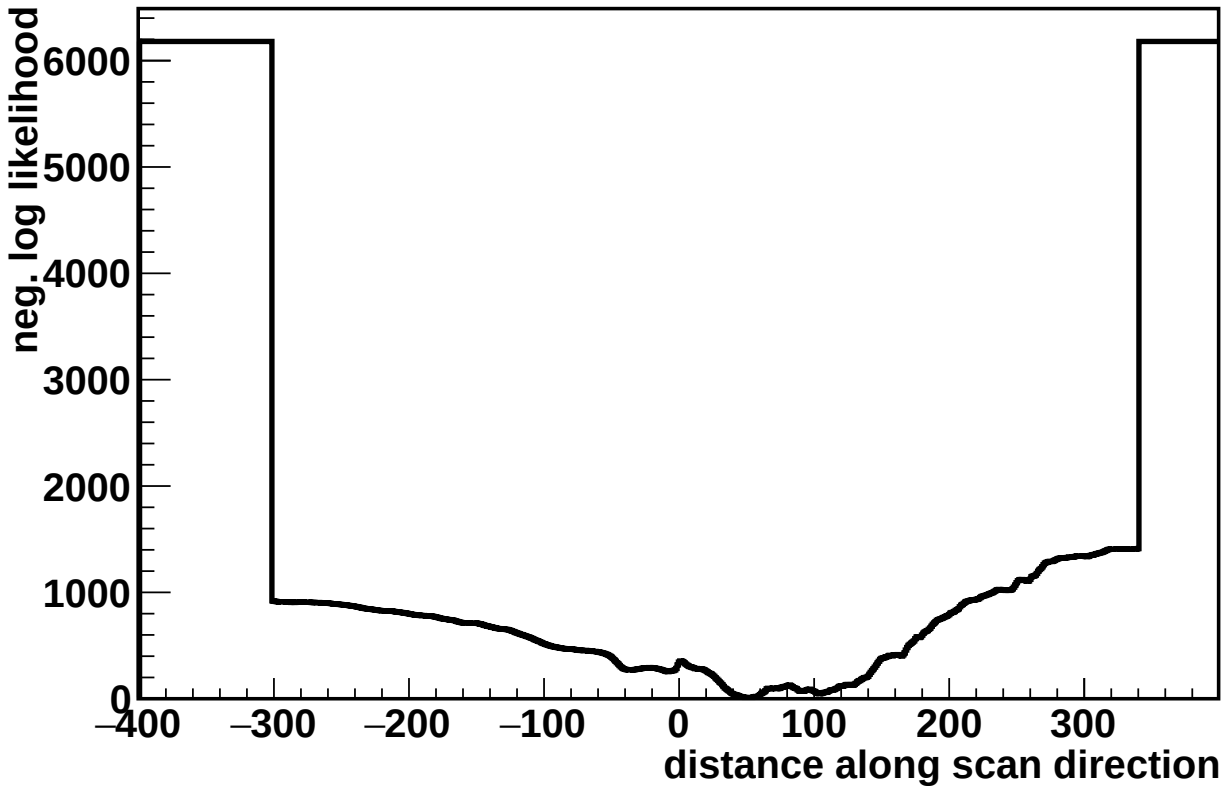
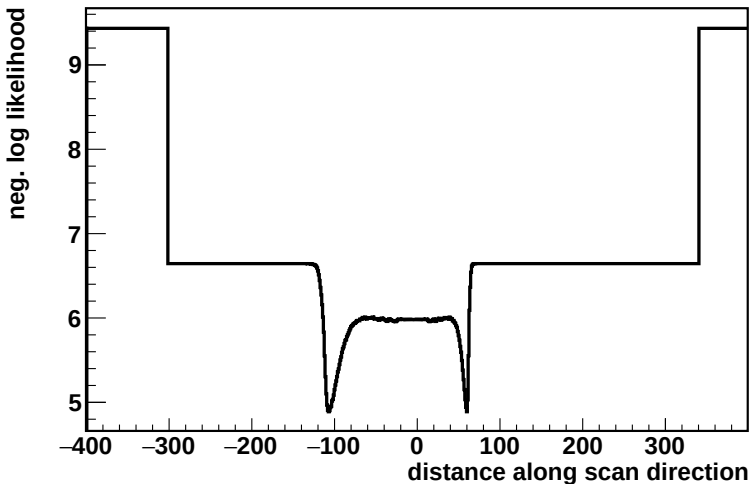
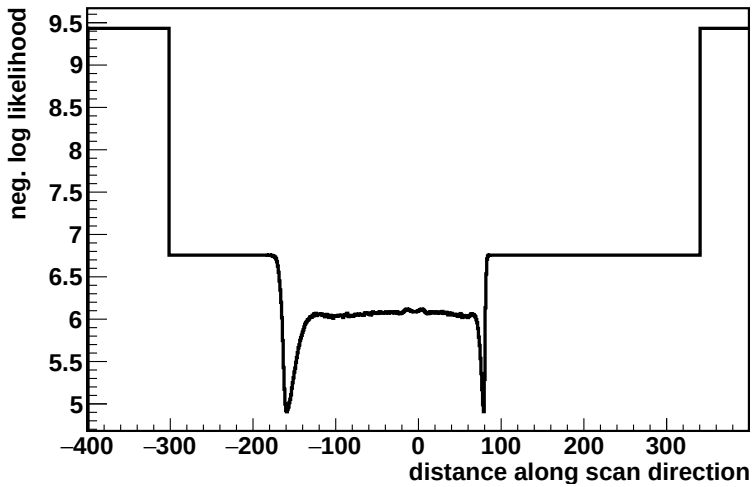


Figure : Two shower likelihood evaluated every meter along the rec direction; 0 is the prefit position

Per hit Likelihood scan with length greater 10 m for numuCC

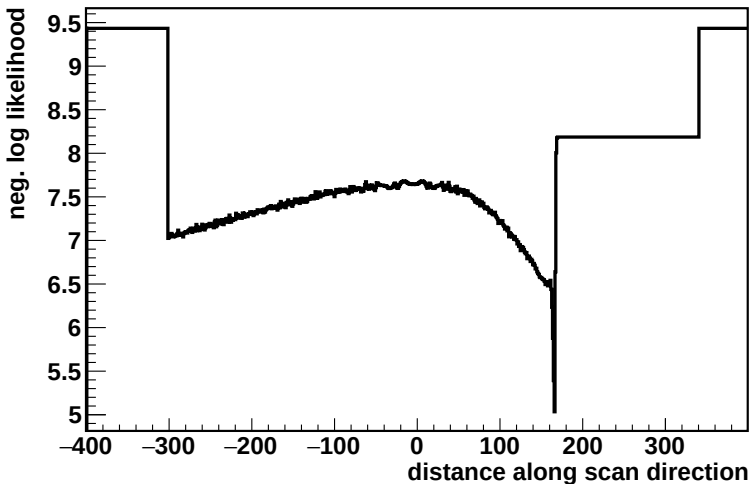


(a) Single muon hit likelihood, time residual to nu vertex is 30 ns

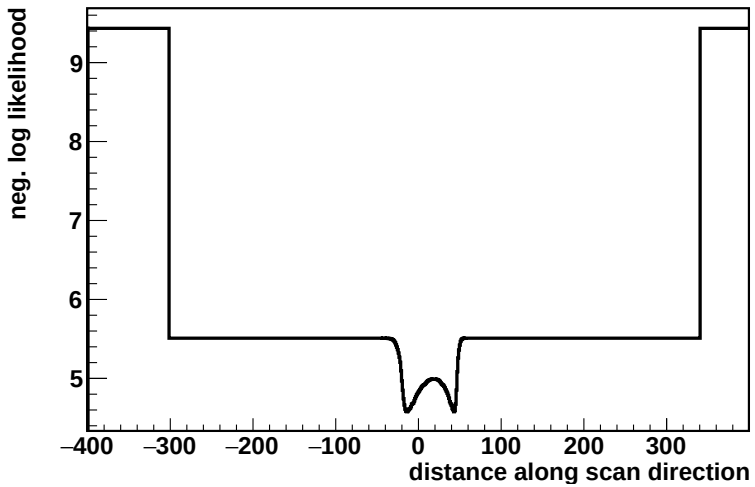


(b) Single muon hit likelihood, time residual to nu vertex is 80 ns

Per hit Likelihood scan with length greater 10 m for numuCC



(a) Single muon hit likelihood, time residual to nu vertex is 530 ns



(b) Single muon hit likelihood, time residual to nu vertex is –30 ns

Reconstructed length for all channels (so far considered)

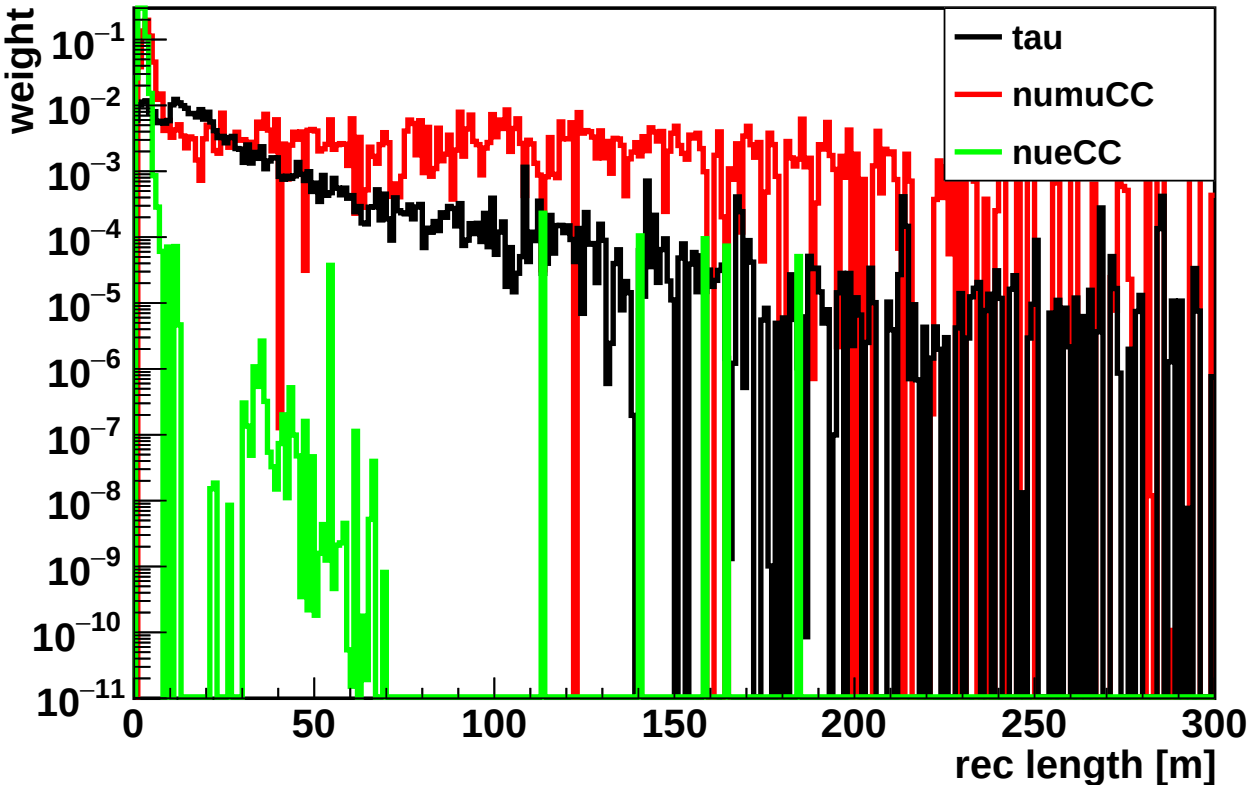
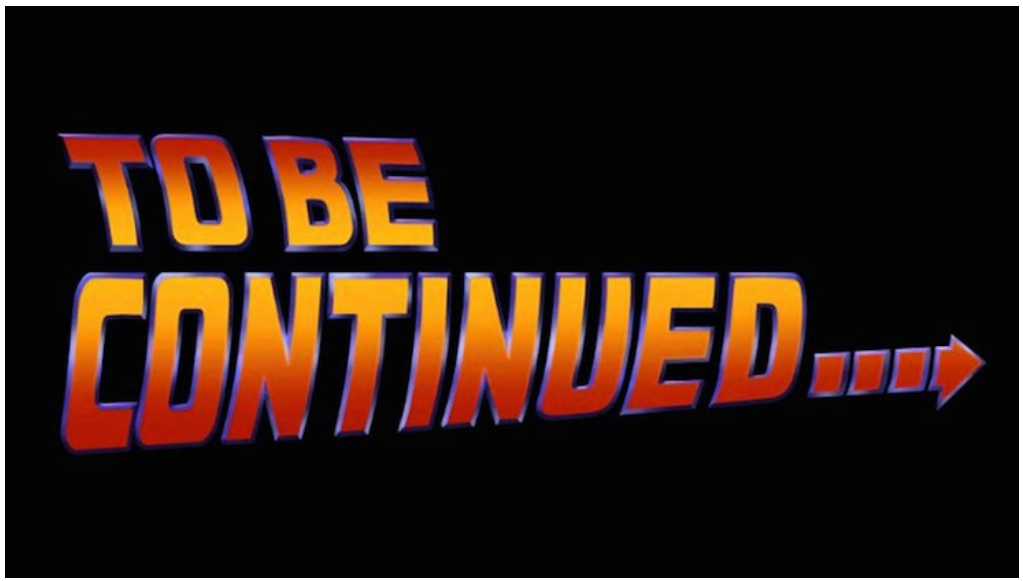


Figure : Reconstructed length for contained events with energy greater 100 TeV (nueCC and numuCC), double contained events with flight length greater 10 m for tauccshow

Summary

- Scanning procedure in place and working (understand rec vertex time shift)
- Tau MC v7 looks good (so far . . .)
- Muon suppression next goal
- Containment requirement to be dropped and effects to be studied



Ad-hoc selection

- Check that second vertex is also contained
- Scan for bins with negative loglikelihood lower than start position (exclude ± 3 m from start):
  - If up- and downstream bins with lower value exist, write second vertex at position of first

Reconstructed length for all channels (so far considered)

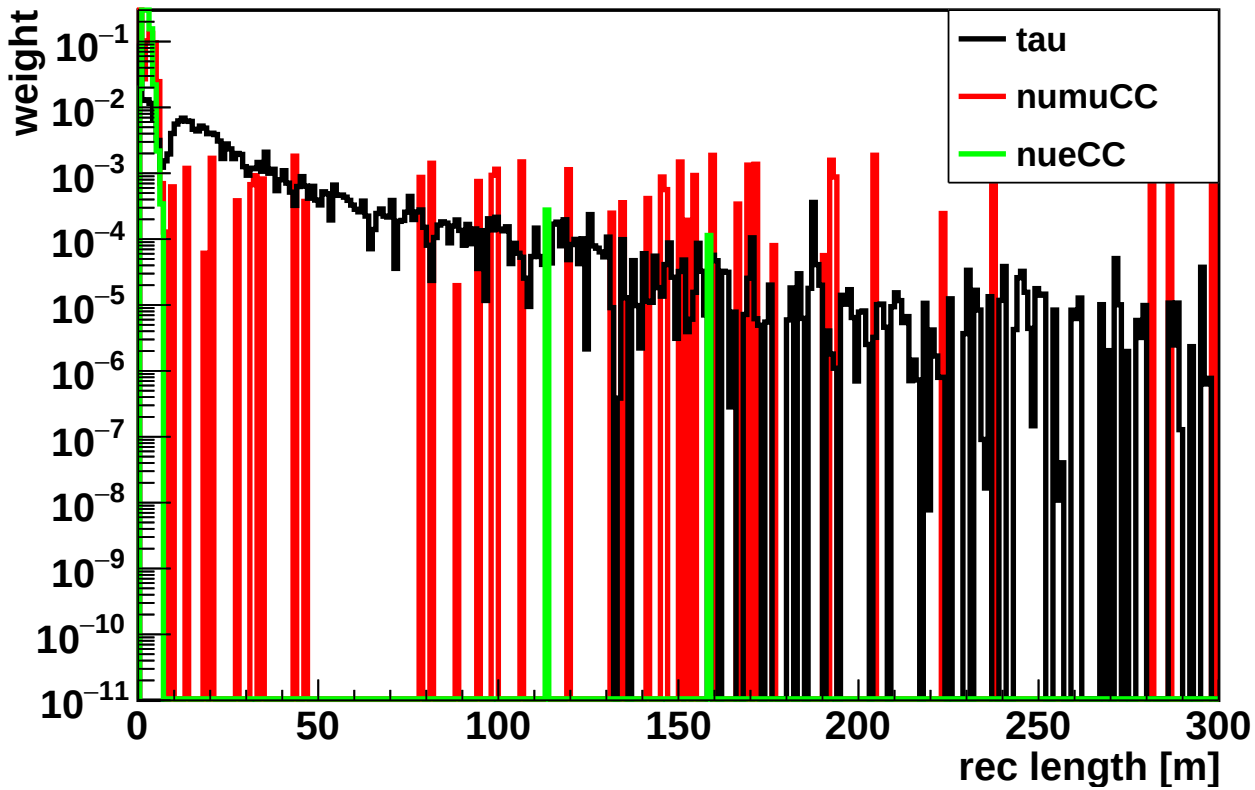


Figure : Reconstructed length for selected events as discussed before, with contained events with energy greater 100 TeV (nueCC and numuCC), double contained events with flight length greater 10 m for tauccshow

Event rates

	no cut [Hz]	ad-hoc cut [Hz]
tau CC show	0.176	0.113
nu e CC	0.0007	0.0004
nu mu CC	0.566	0.035