ORCA Data: Comparison of 4 and 6 Line Configurations

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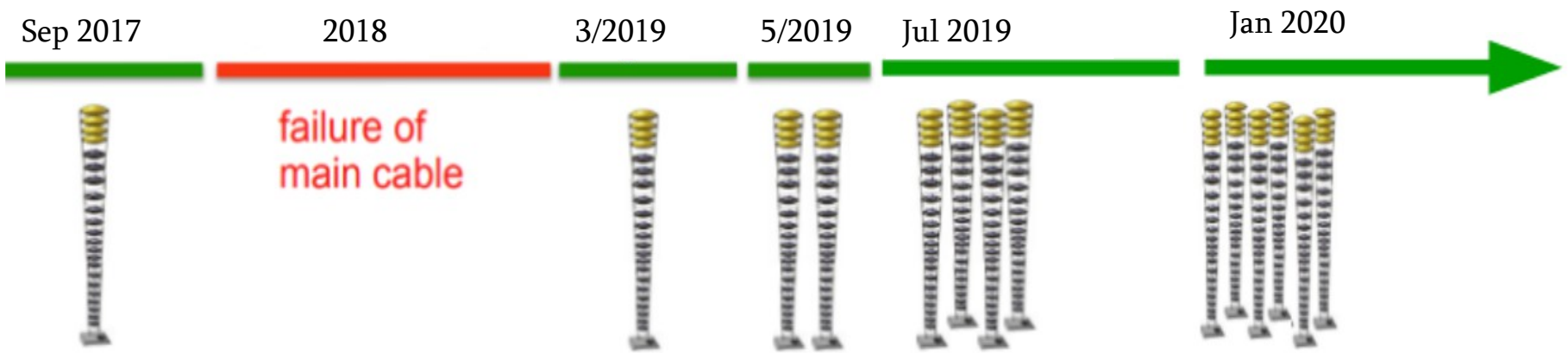
Introduction

- ORCA data
- **ORCA6 vs ORCA4 basic level comparison:**
  - Livetimes, rates
  - Hit level
  - Track level
- **ORCA Summary and Outlook**

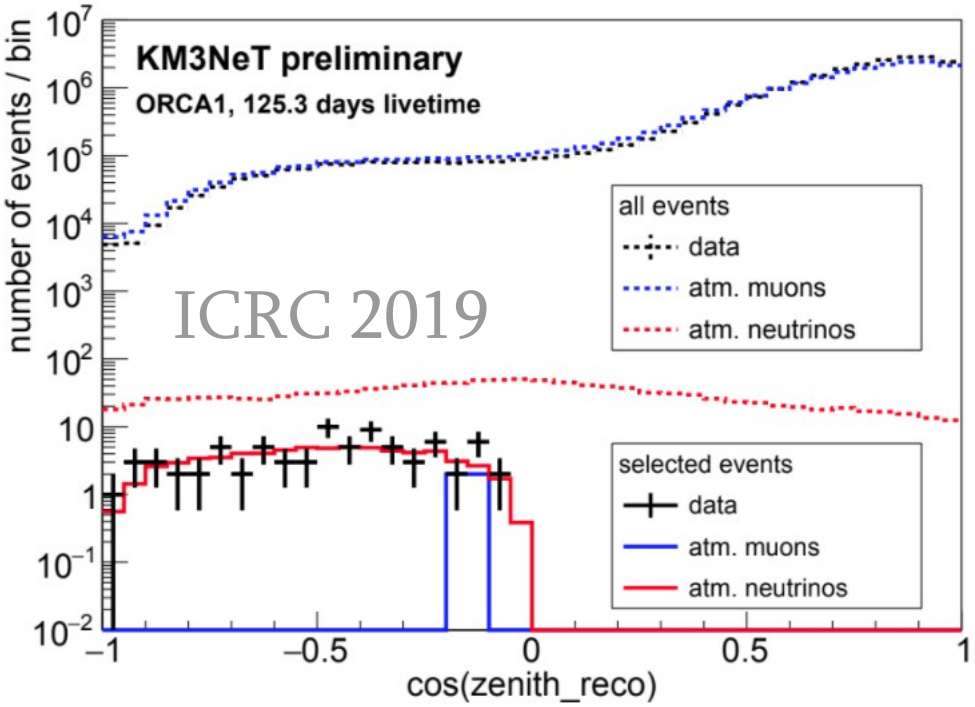


ORCA data (HPSS@Lyon-cc): /in2p3/km3net/data/raw/sea

/in2p3/km3net/data/KM3NeT_000000{Config}

ORCA4: 44
ORCA6: 49

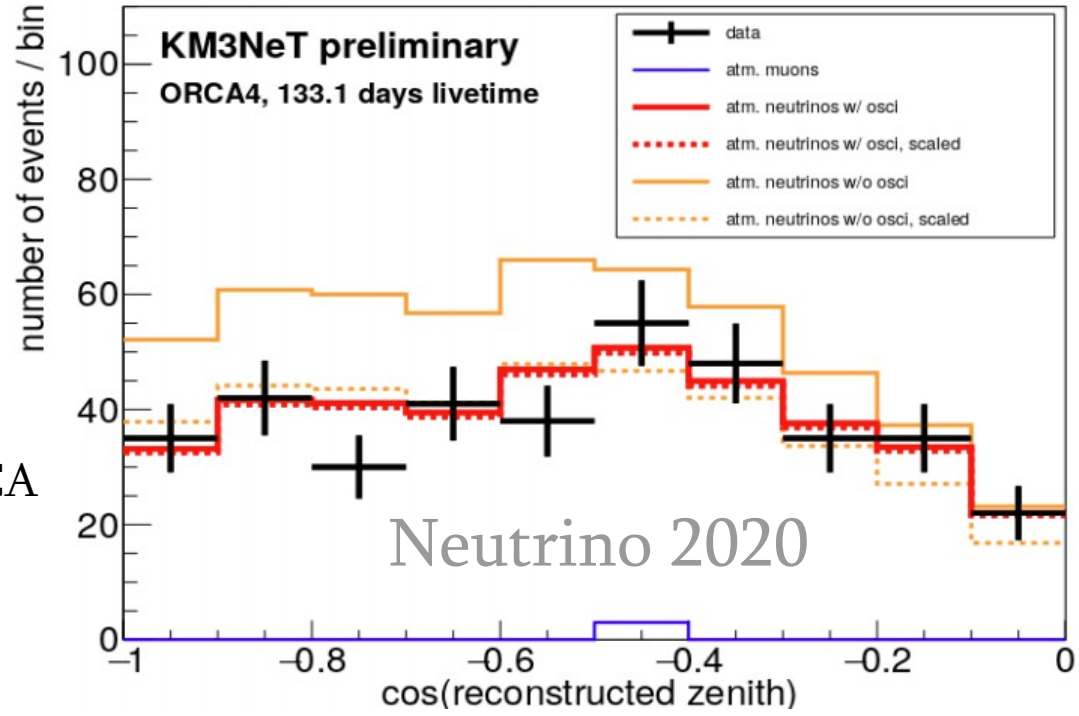
ORCA Neutrinos



The KM3NeT Collaboration*
Pos (ICRC2019) 911

Atmospheric Neutrinos Detected with the First KM3NeT Detection Units of ARCA and ORCA

R. Coniglione, J.Hofestädt, A.Sinopoulou, E. Tzamariudaki, D. Zaborov



Neutrino-2020

Observation of the atmospheric neutrino flux with the first detection units of KM3NeT/ORCA

L. Fusco, J.Hofestädt and D.Stavropoulos

(On behalf of the KM3neT Collaboration)

ICRC-2021: Berlin, 15-22/7/2021 (deadline for the abstracts: 15/02/2021)

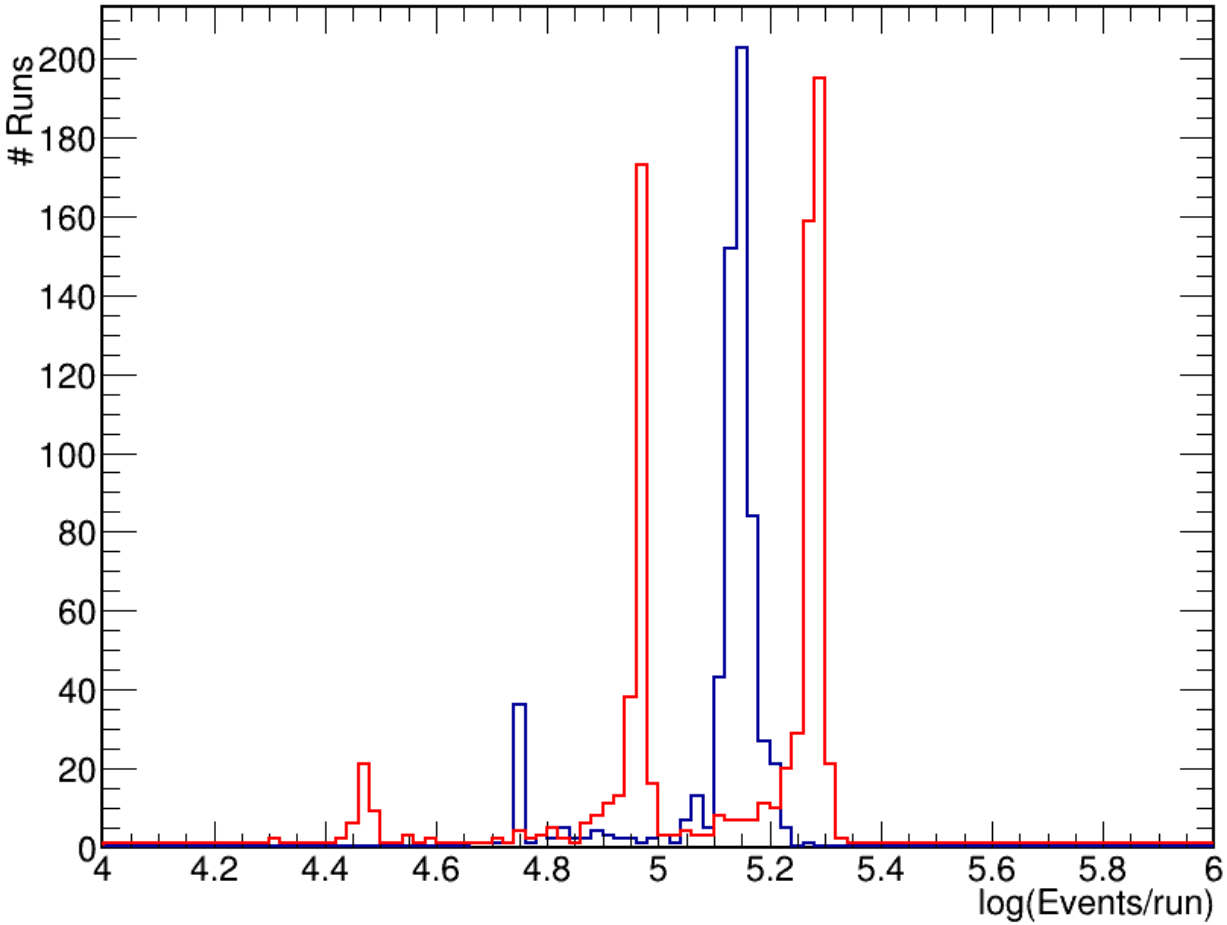
ORCA6 and ORCA4 Event Samples

- ORCA6 processed data: first release on 29 July 2020 (Luigi Fusco)

853 files (aanet-format): datav5.42.jchain.aanet.0000**7231**.root (Jan 27/2020, 12:29)
datav5.42.jchain.aanet.0000**8292**.root (Jul 11/2020 5:59)

846 runs in our analysis: 117 136 924 (1.2×10^8 events)

"Corrapted runs" (7):
7305, 7306, 7312, 7313, 7332, 7792, 8117



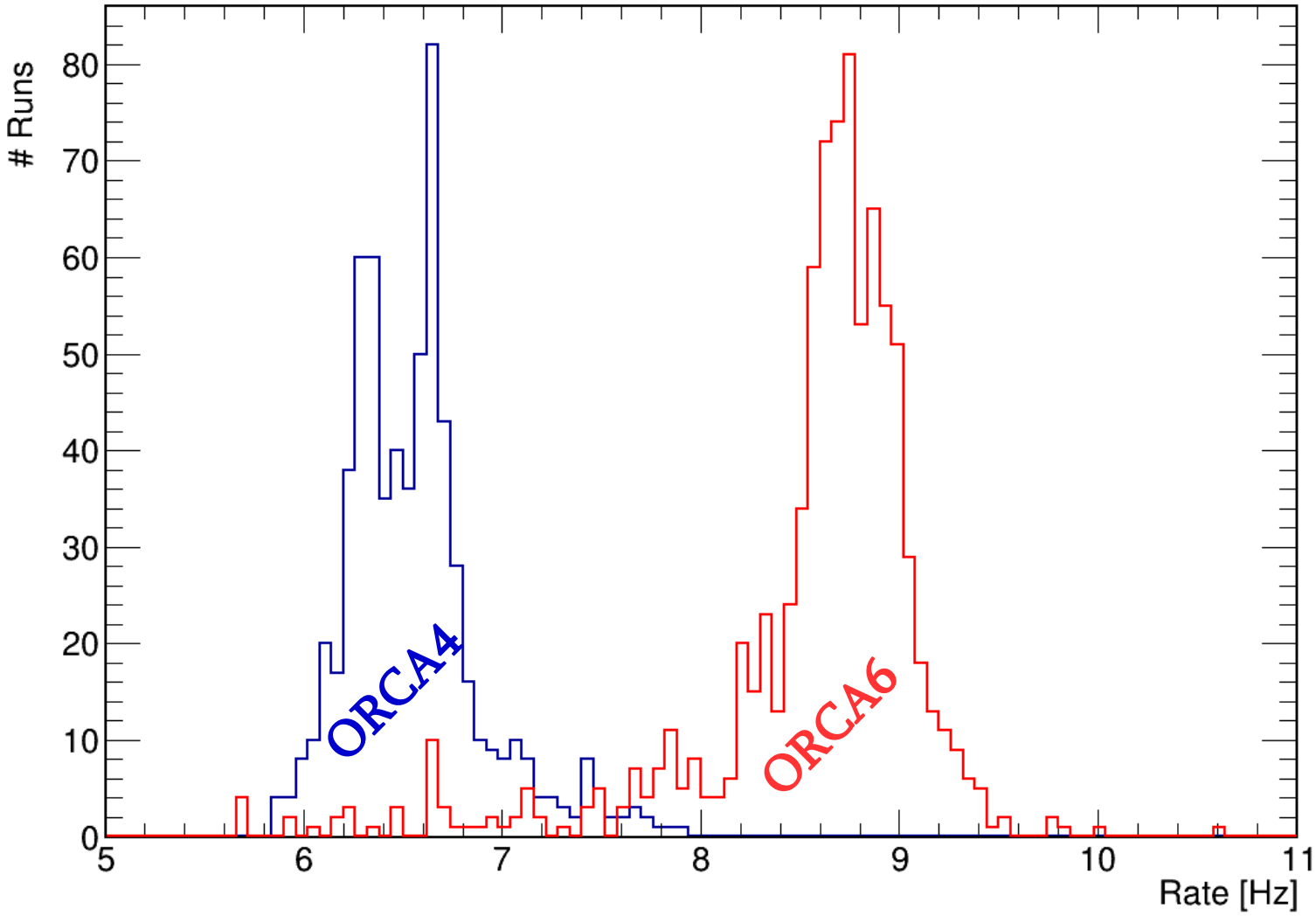
Data comparison:

- **ORCA6:** 846 runs
  1.2×10^8 events

- **ORCA4:** 634 uns
  8.4×10^7 events

Run selection by D. Stavropoulos
Analysis Elog
ORCA4 : **583, 594**
ORCA6: 613
Up to May 2, 403 runs
82.5%, 73.1 days

ORCA6 and ORCA4 Processed Event Rates



R – Rate per run

$$R = \frac{N_R}{t_R}$$

N_R – Events in the run

t_R – Duration of the run

R_4=6.6±0.3 Hz (634)

R_6=8.6±0.6 Hz (846)

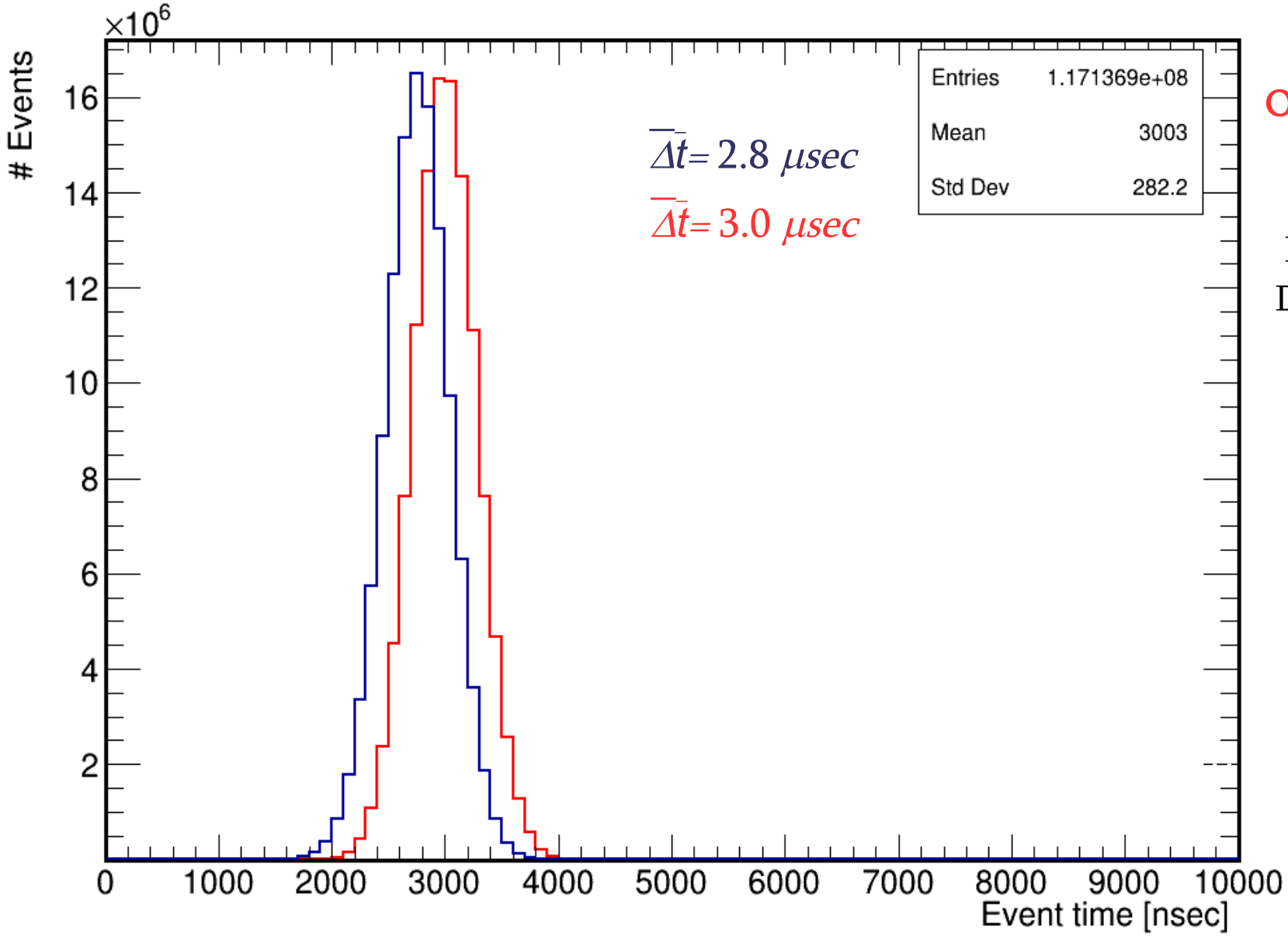
R_6/R_4= 1.30

ORCA6 vs ORCA4:
30% increase

Livetime: 147.5 days (ORCA4)
159.0 days (ORCA6)

Expected neutrino rate in ORCA6:
about 4 ν_μ/day

ORCA6 and ORCA4: Event time



ORCA6:

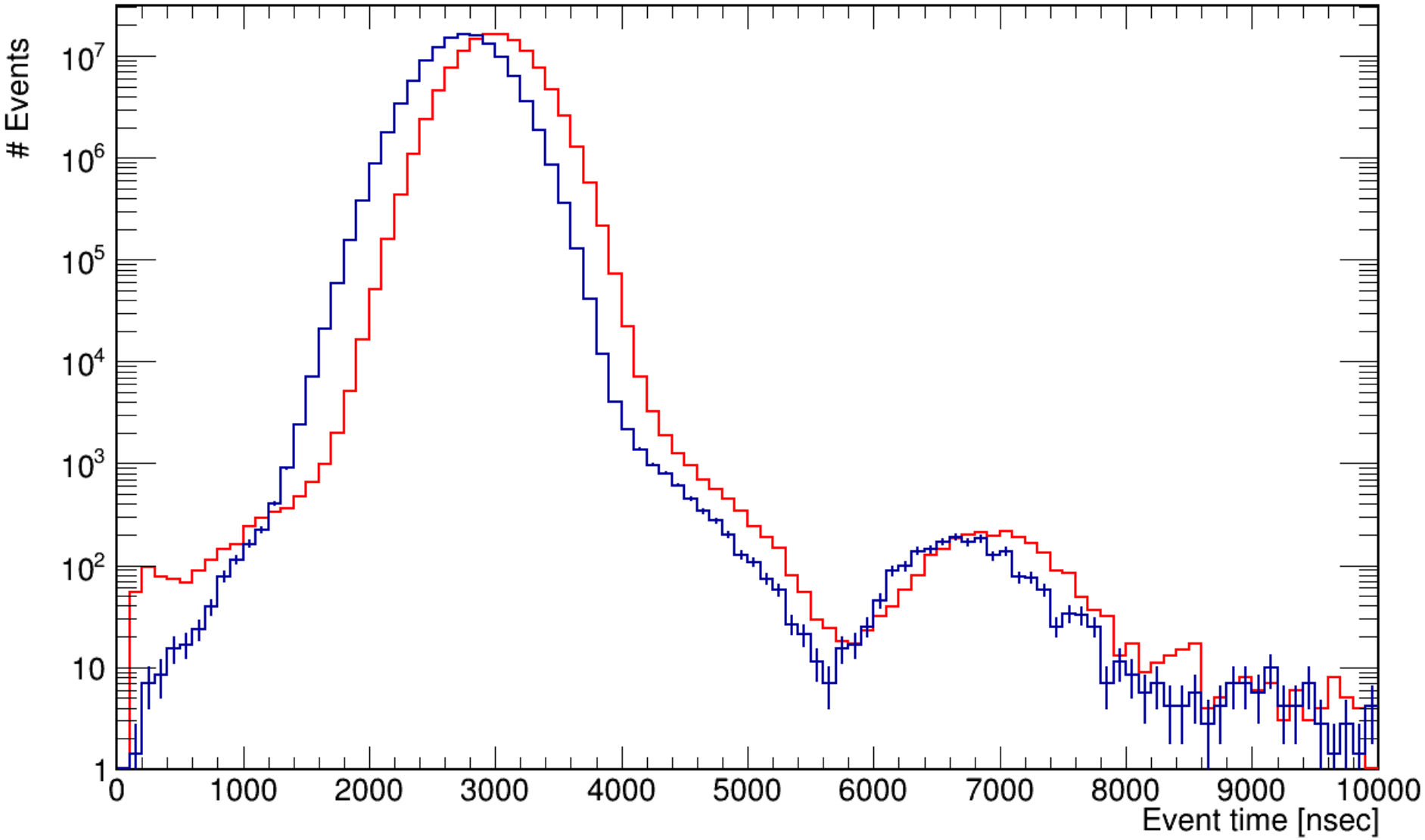
6 Lines /DU

DU =18 DOM

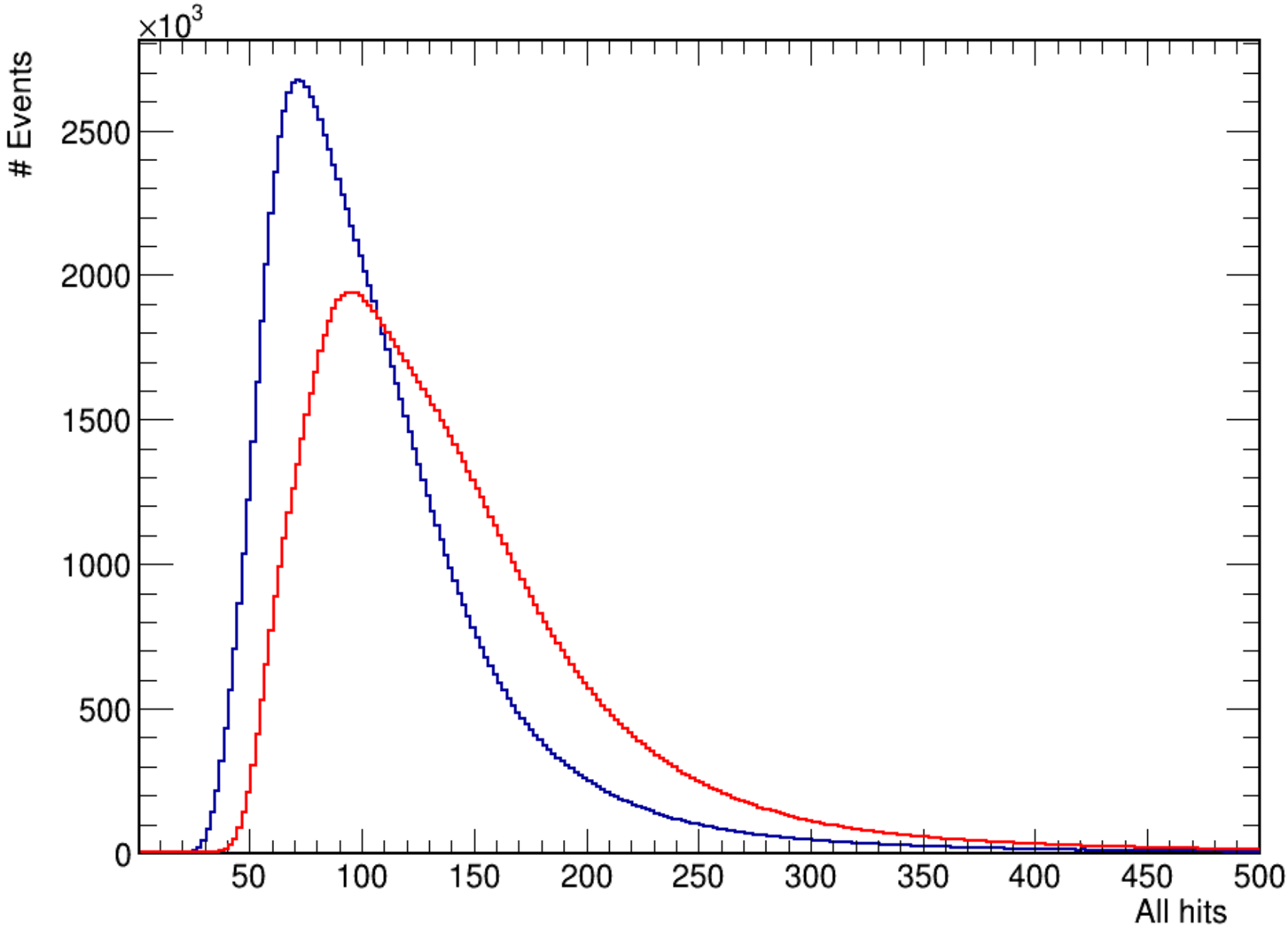
DOM = 31 PMT

Event time – time interval between first and last hits $\Delta t = t_n - t_0$

ORCA6 and ORCA4: Event time



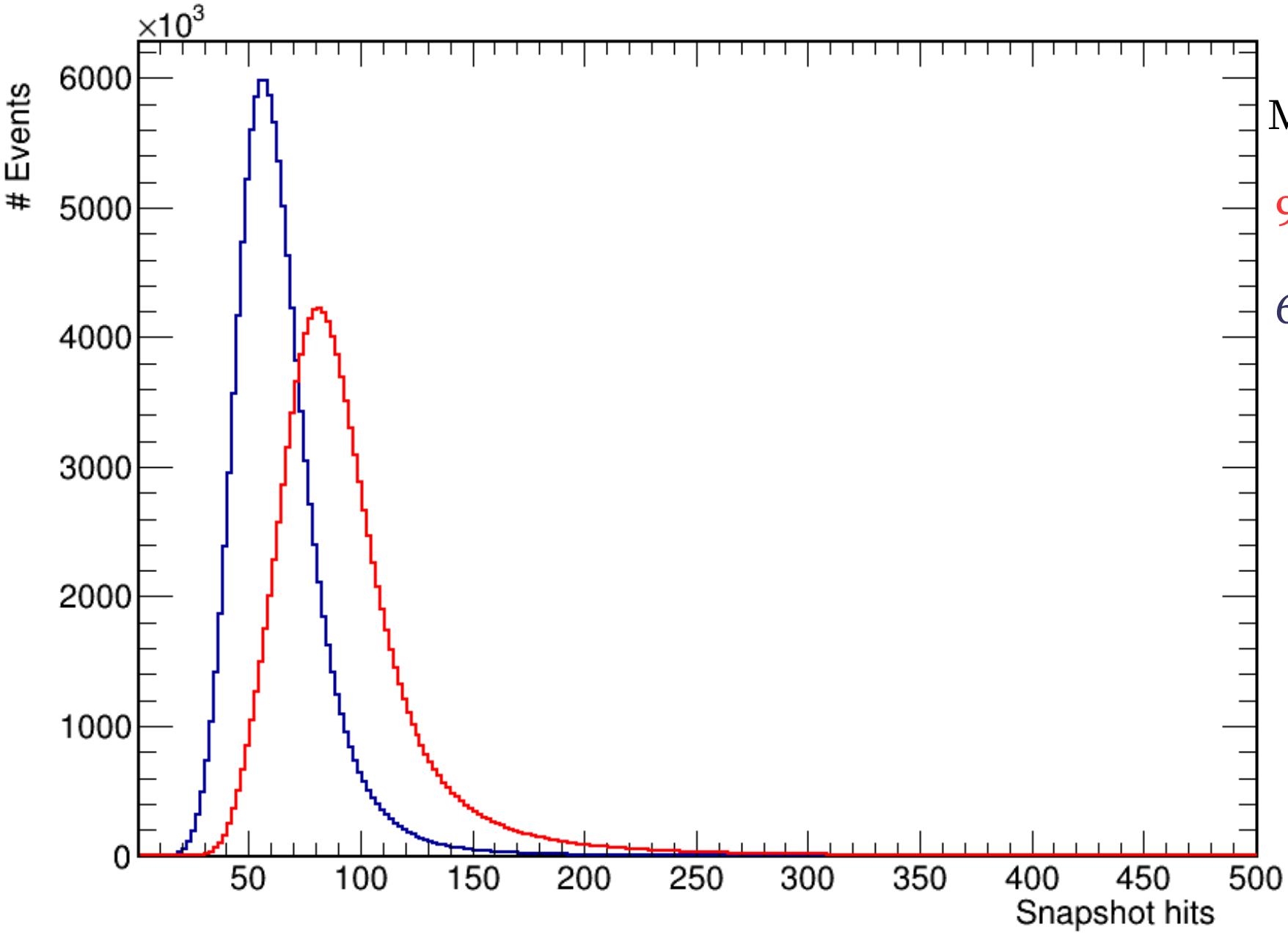
ORCA6 and ORCA4: All Hits



142.4 ± 68.4

109.4 ± 56.9

ORCA6 and ORCA4: Snapshot Hits

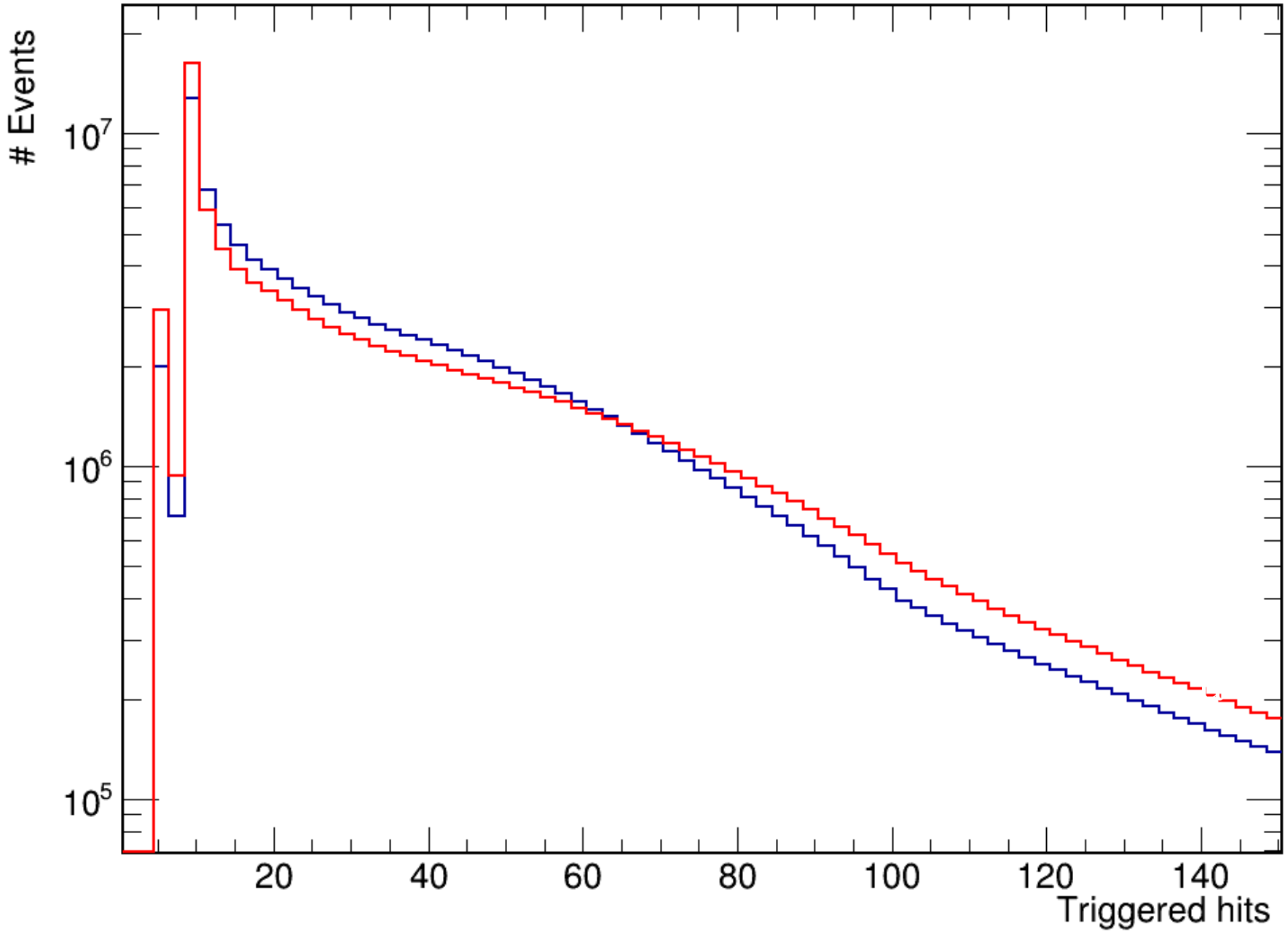


Mean / Fit

94.6 / 82.7

64.0 / 58.7

ORCA6: Triggerd Hits



Mean:

46.3

50.3

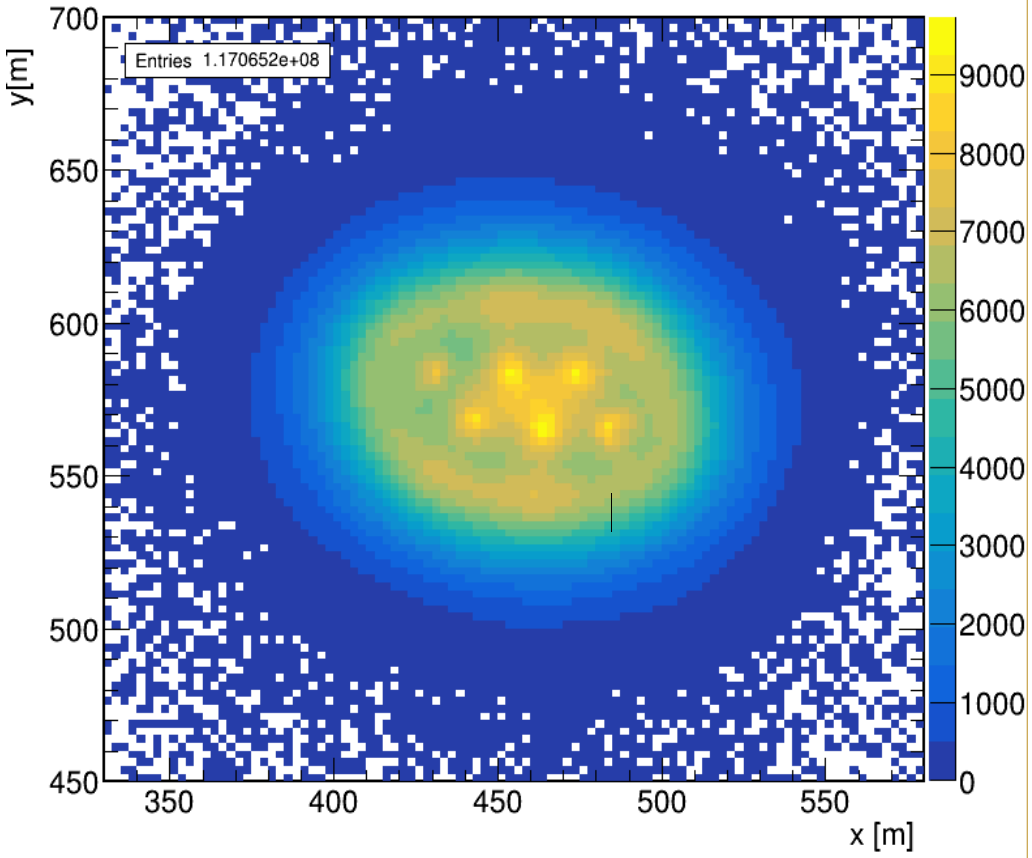
Reconstructed Tracks: Starting Pozition (x,y)

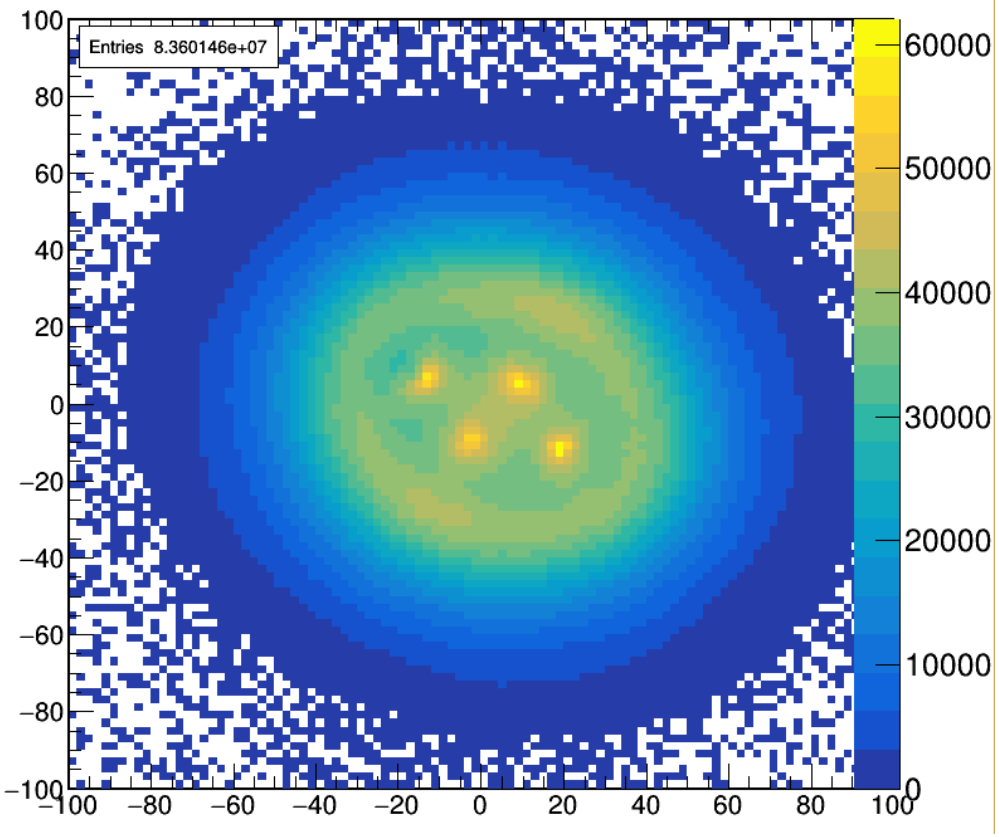
Reconstructed track parameters:

Starting position: x_0, y_0, z_0 and time t_0

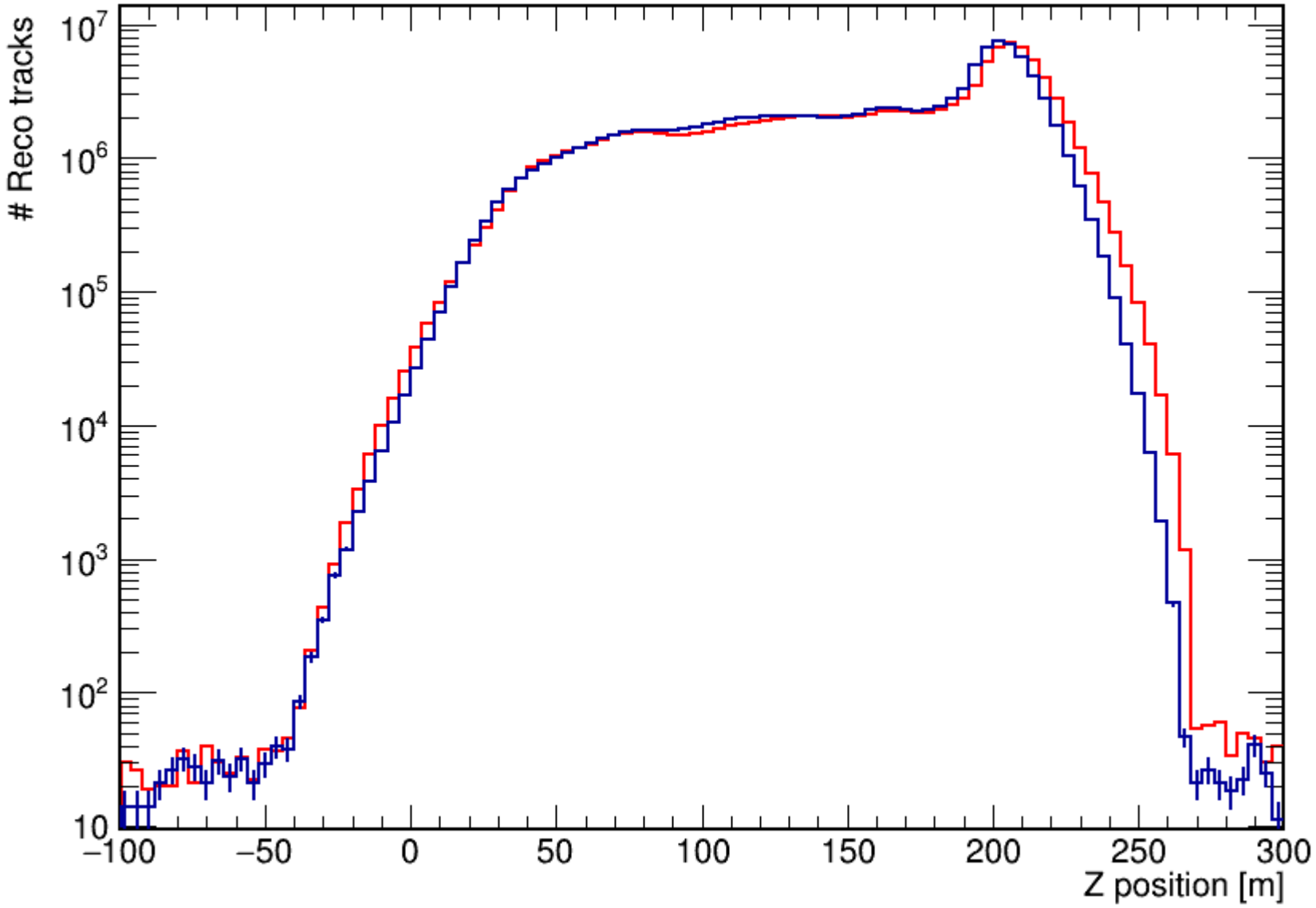
Direction (Θ, ϕ): cosX, cosY, cosZ ($\cos\Theta$)

Reconstruction (fit) parameters: Lik, hits per track, . . .

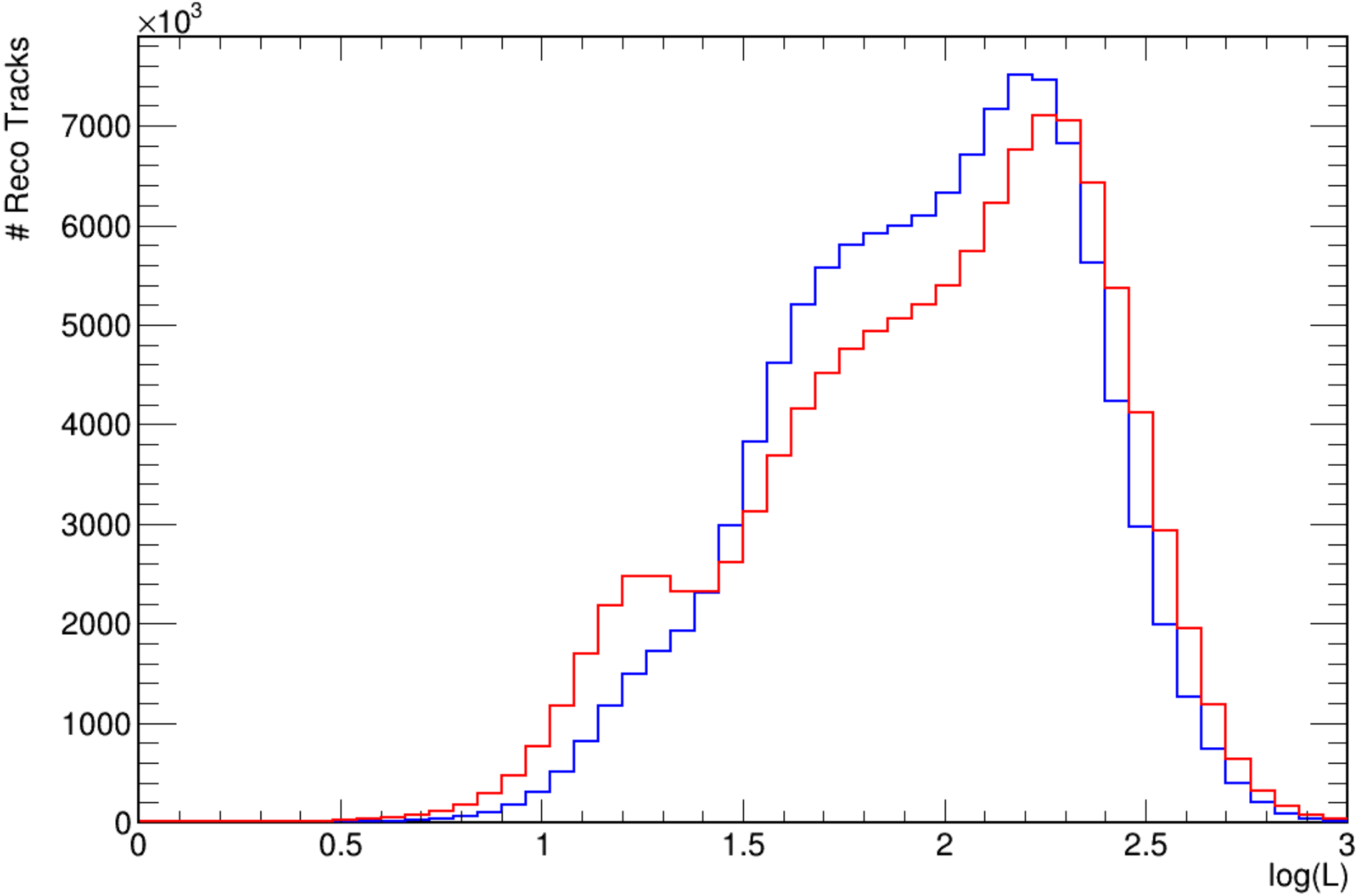




Reconstructed Tracks: Starting Pozition Z

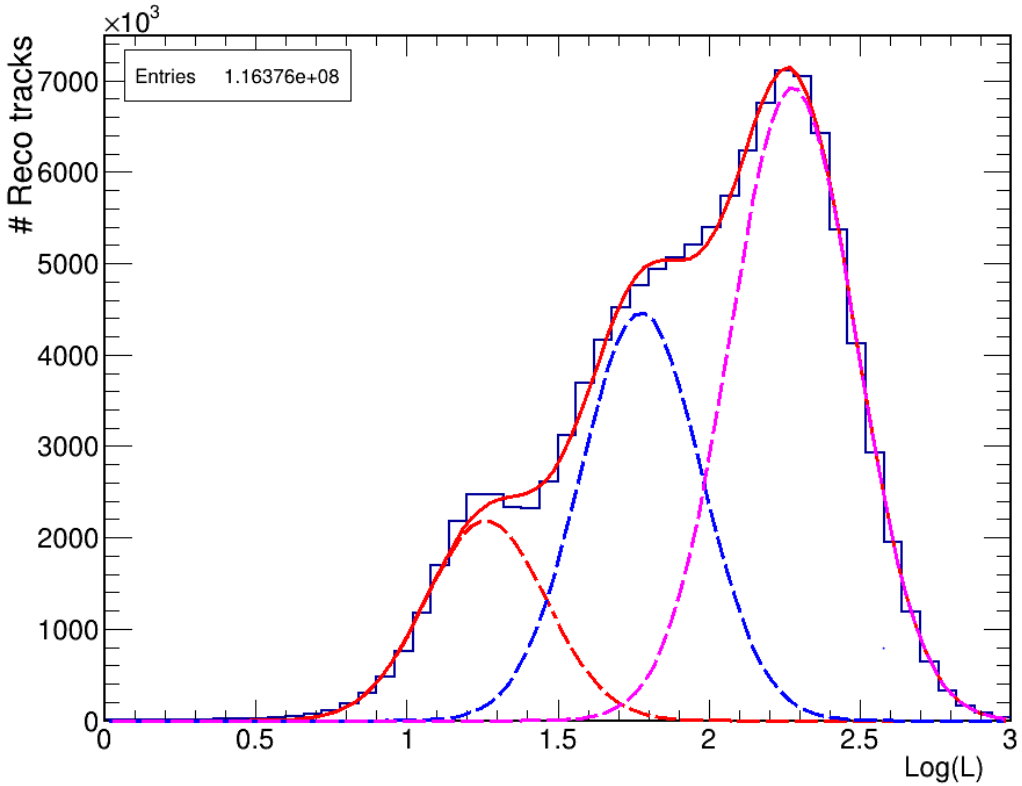


Track Likelihood

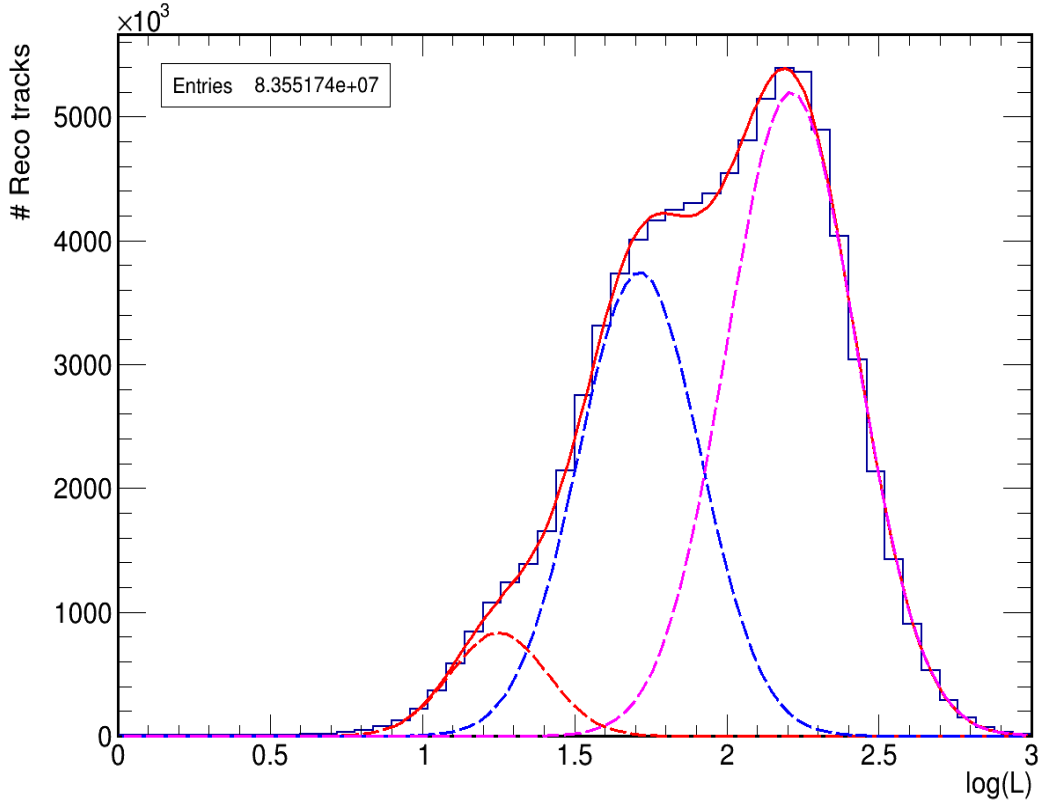


Reco Quality

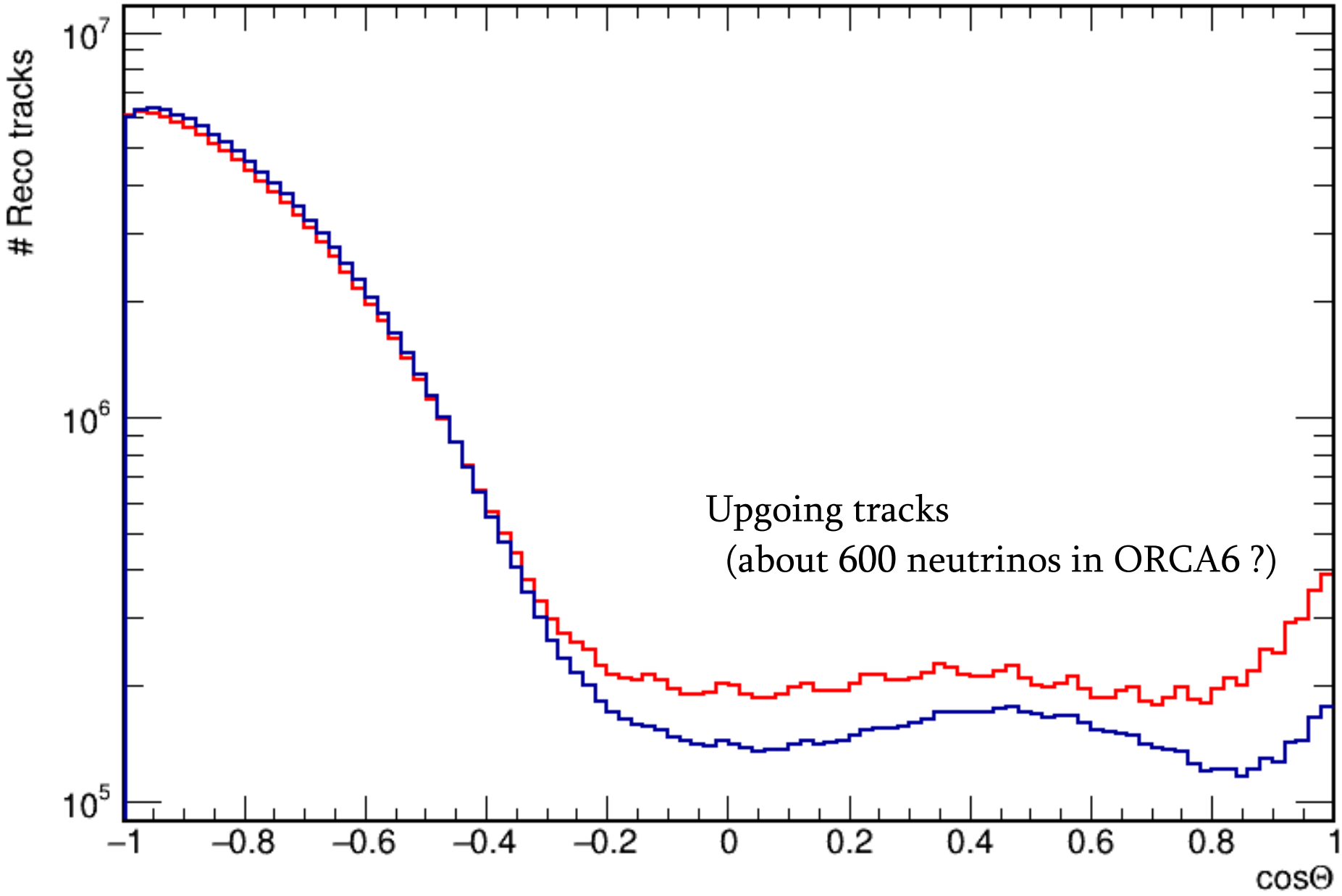
ORCA6



ORCA4



ORCA6: Track Direction: cosΘ



Summary and Outlook

- ORCA6 and ORCA4 processed events were compared on a “basic“ level (histograms from the event parameters in the aanet format – hits, tracks)
- Event Rate for ORCA6 is increased by 30%
- ORCA6 data shows similar features as ORCA4 (for example “long time“ events)
- ORCA6 processed data includes more events with low numbers of triggered hits, hence more misreconstucted events
- Simple rescaling number of neurinos reconstructed in ORCA4, gives about 600 neutrino events for this ORCA6 sample
- Next steps:
  - Analysis of ORCA6 MC events and comparison with data
  - Optimization of criteria for the neutrino (ν_μ) event selection