



# Status of Muon Decay Analysis in KM3NeT/ORCA6

Gogita Papalashvili

ANTARES/KM3NeT Collaboration Meeting

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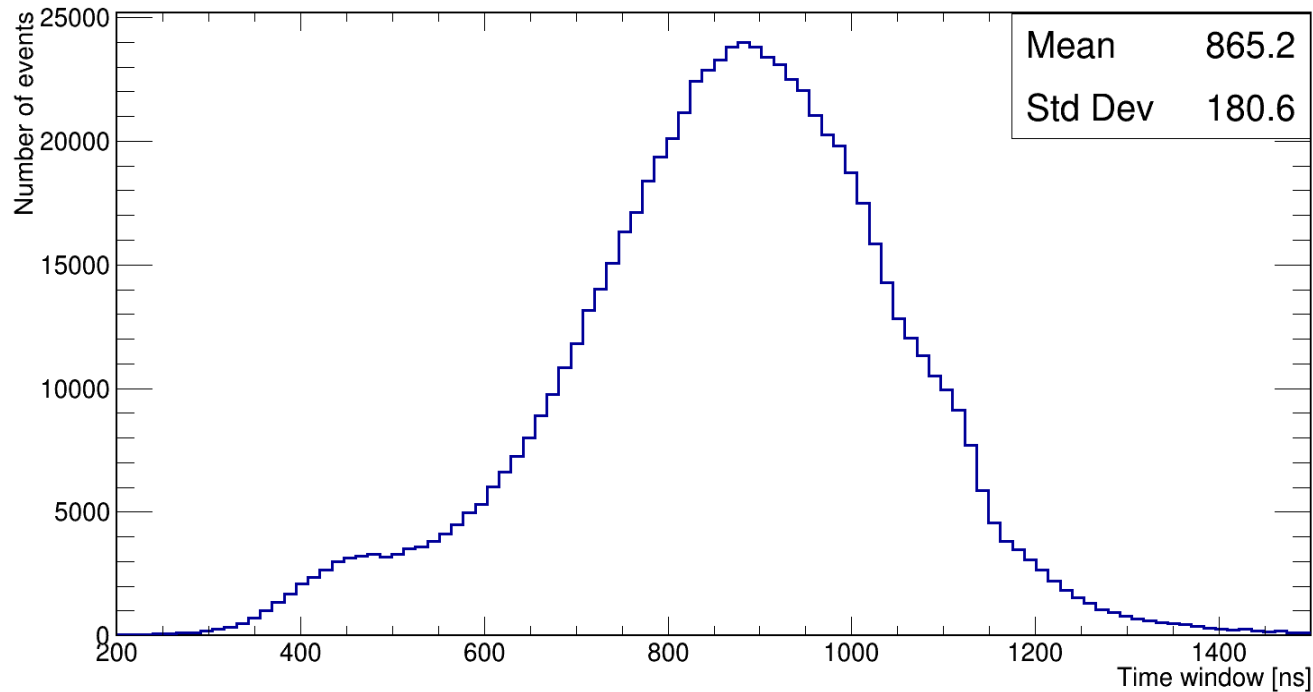
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# Muon Decay Time Window for ORCA6

$$\mu \rightarrow e + \nu_{\mu} + \nu_e \quad \exp(-t/\tau_{\mu}), \quad \tau_{\mu} = 2196.98 \text{ ns (PDG)}$$

Time window obtained from mupage files, defined as  $t_{\text{last hit}} - t_{\text{stop}}$



About 30% of muons stopped in ORCA6 will decay in this time window

# Data and MC for Muon Decay Analysis

ORCA6 data:

# of files	2 610 (2613)
# of events	$4.30 \times 10^8$
# of live days	551

ORCA6 MC:

# of files:	3014 ( 50% of available MC)
# of events	$5 \times 10^7$
# of days	77

**DSTs are made for events with muon stopping point < 3.2m**

ORCA6 DST:

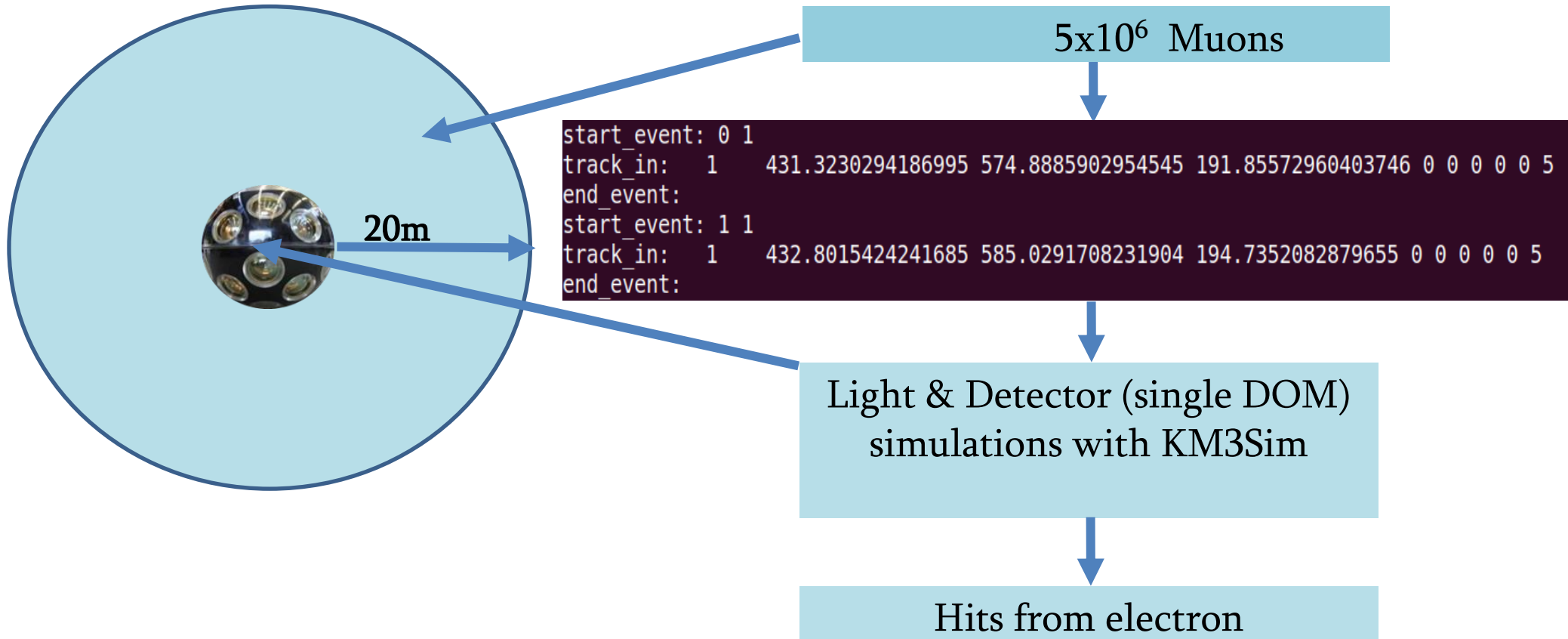
# of files	2 610 (2613)
# of events	$9.57 \times 10^6$

Expected stop in 3m: 477582

ORCA6 MC DST:

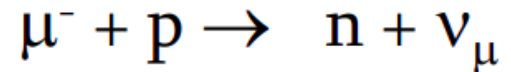
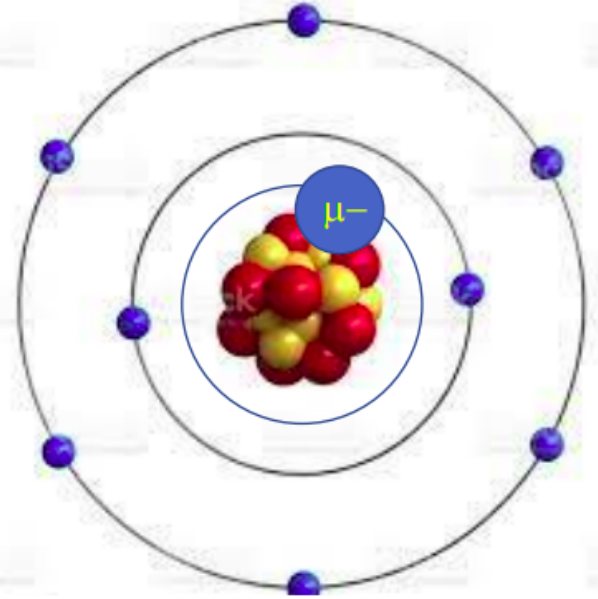
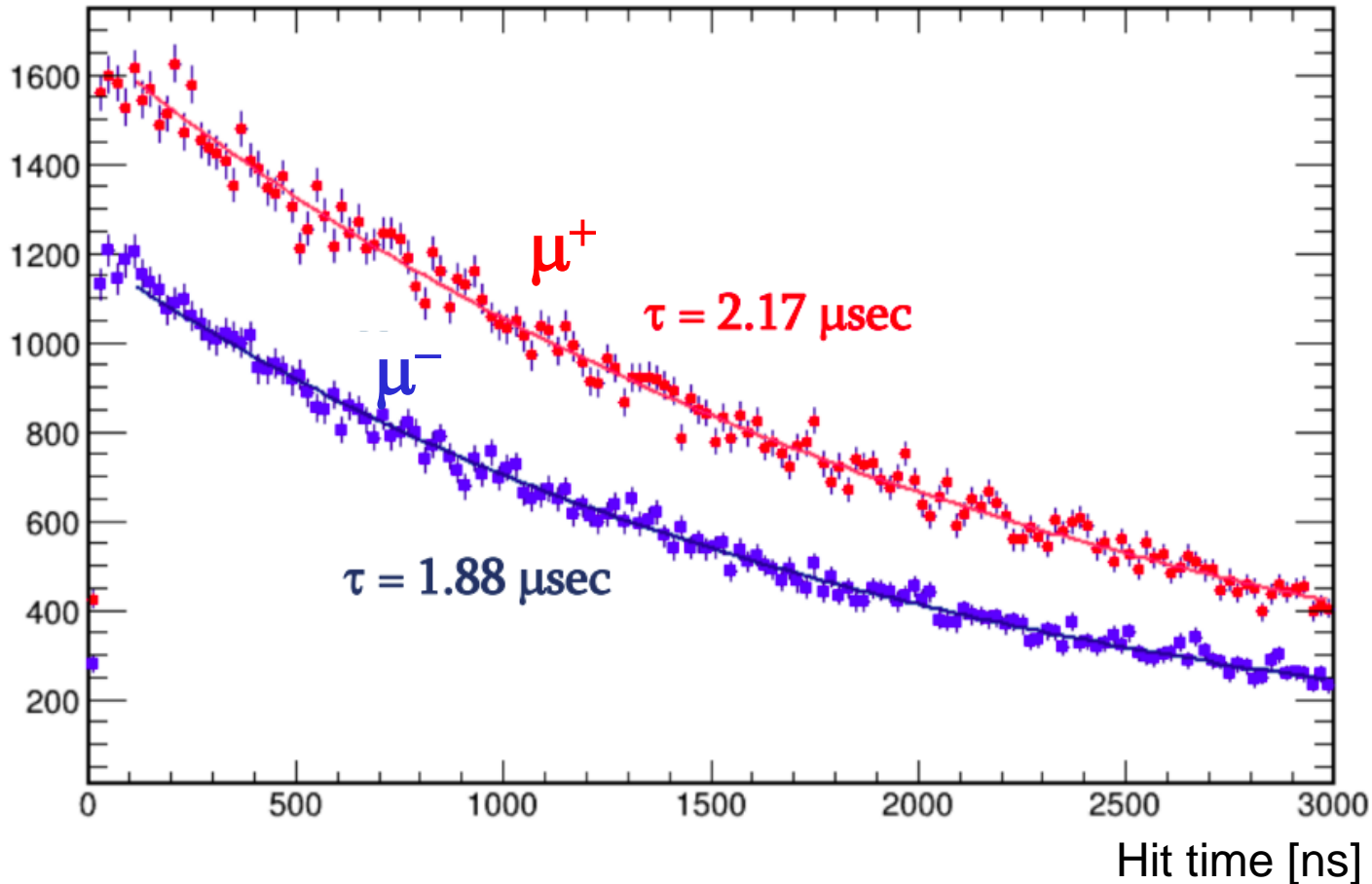
# of files	3014
# of events	$7.6 \times 10^5$
# of days	77

# Muon Decay Signals in KM3Sim



# Muon Decay simulations with KM3Sim

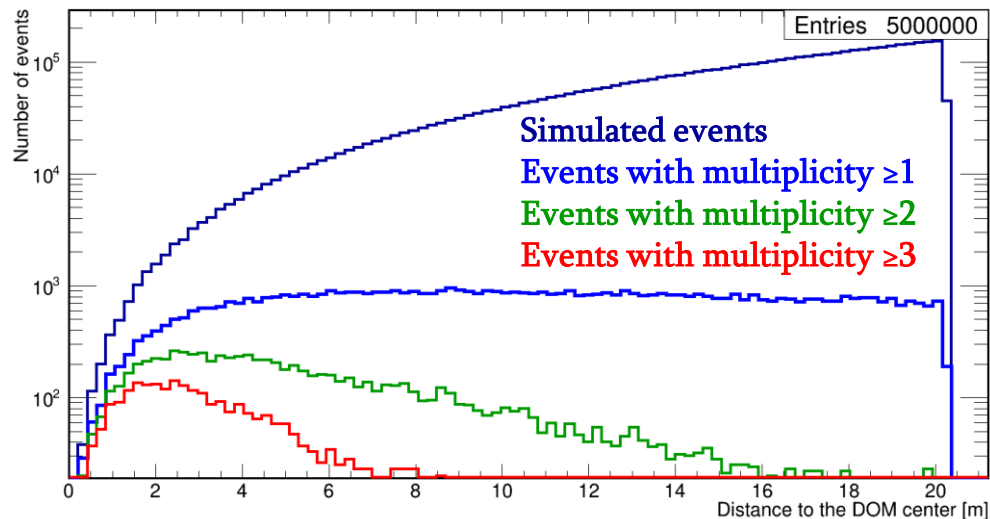
Hit time = First hit time of the event



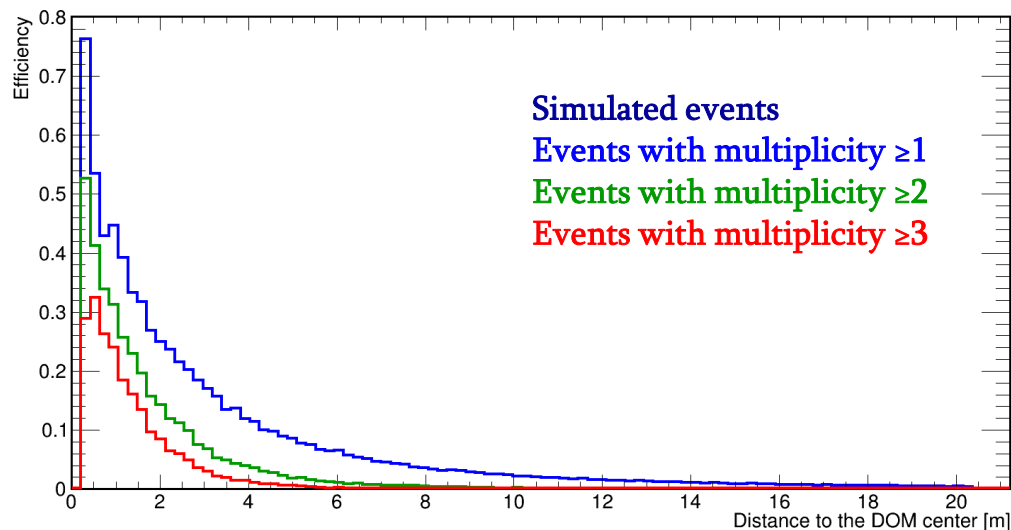
D.F. Measday,  
Physics Reports 354 (2001) 243

# Muon Decay Signals DOM

Muons were randomly (uniformly in  $x,y,z$ ) distributed around a DOM with a max distance of 20.22m from the center of the DOM (20m from the DOM edge)

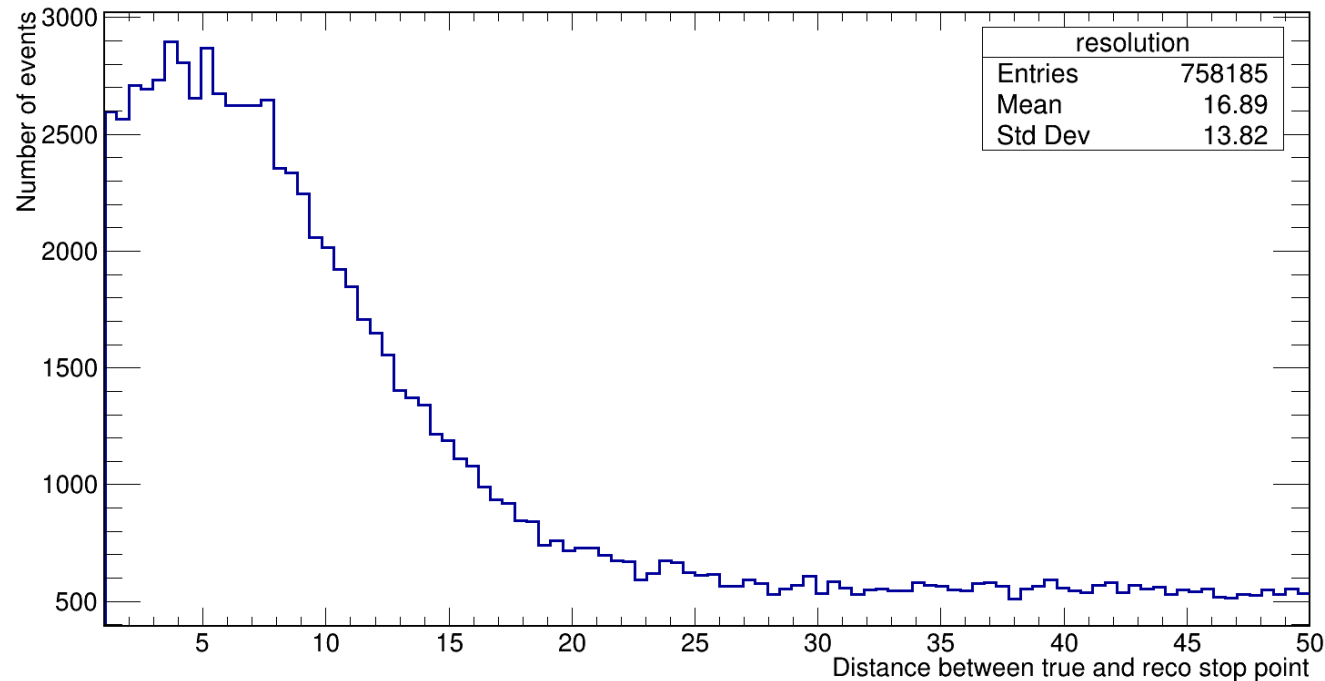


Efficiency of getting a hit with respect to the distance



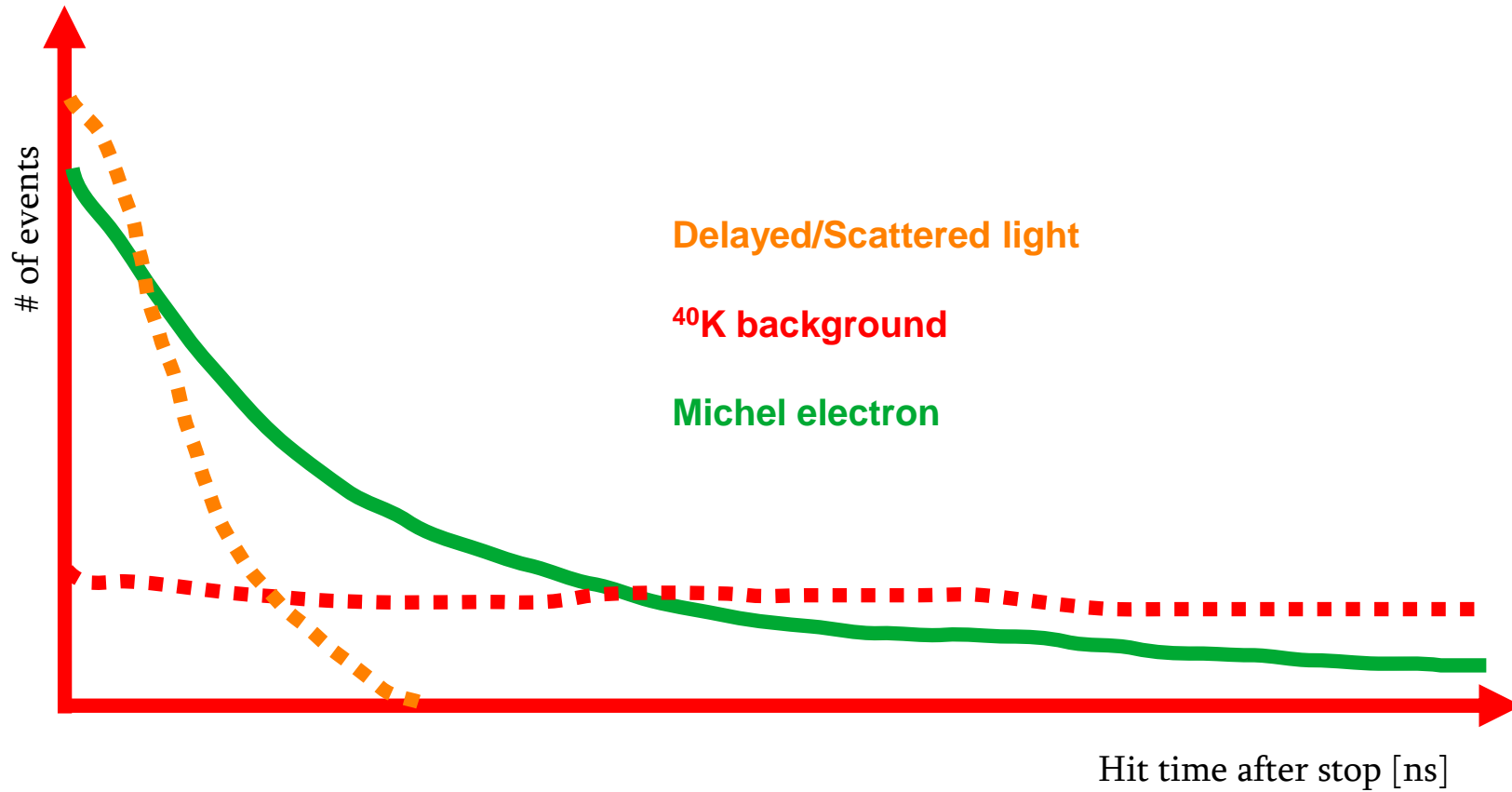
# Muon Stopping Spatial Resolution

Muon stopping point spatial resolution for MC (reco) tracks without cuts



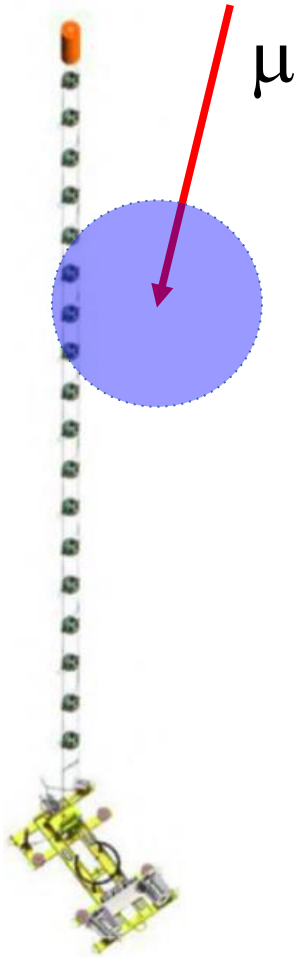
Efficiency for closest DOM ( $d < 3$  m) is about 9%

# Expected DOM Signals





# Outlook for Muon Decay Searches



- ◆ Finding the  $\mu$ -stopping point in the ORCA6 volume
- ◆ Selecting the DOMs within  $d_{\min}$  distance from the  $\mu$ -stopping point ( $d_{\min}$  to be optimized)
- ◆ Searching for Michel electron signals with multiplicity  $\geq 2$