

# Muon DIS (Deep Inelastic Scattering) Background

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# Outline



**DIS of muons should be split in two possible scenarios**

1 .Muons hitting the walls of the Decay Volume ( from 18 millions muons only 18 hits the UVT )

→ Simulation in several stages

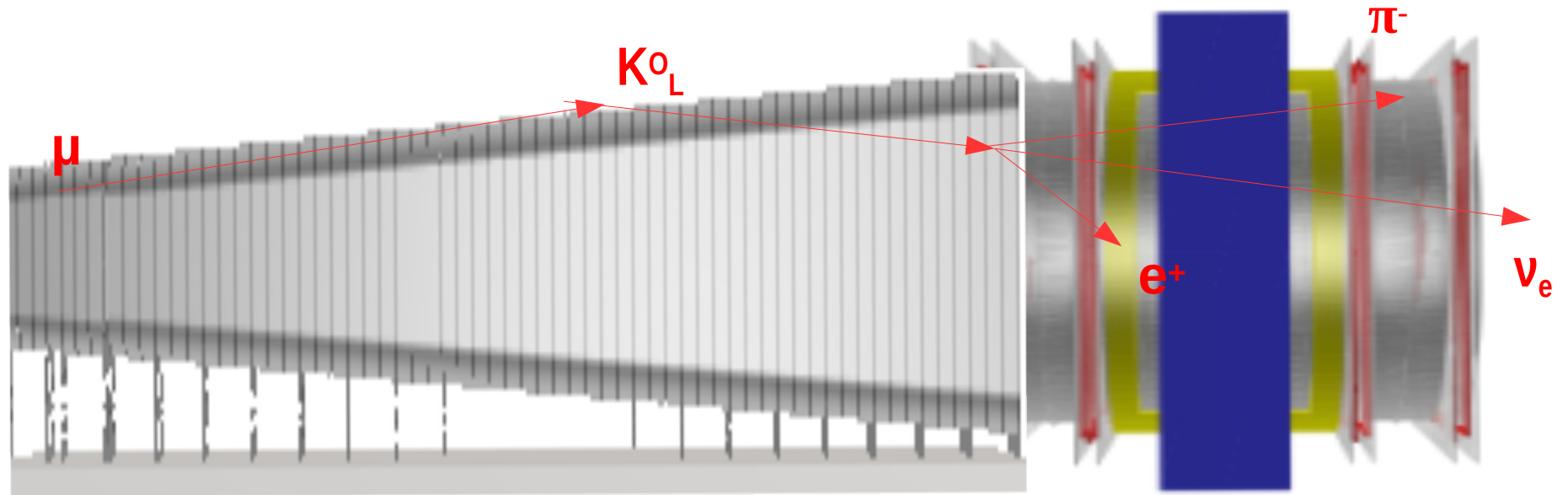
→ Procedure needed to increase the statistics for this process?

2. Muons hitting the Cavern

→ Muon Shield bend most of the muons in the Cavern

→ the statistics is much higher

# DIS with Muons hitting the Vessel



# DIS with Muons hitting the Vessel



## Stages of simulation

1. Use muons from Muon Background simulation as input

→ Muons hitting the UVT, SBT ([see here](#))

→ A possibility to increase the statistics of muons hitting the Vessel

- Use muons from Muon Background without the magnetic field

- Rescale by the expected reduction, get a lower limit in reduction from Muon Background

- Attention: SBT rejection not necessarily the same for both event types

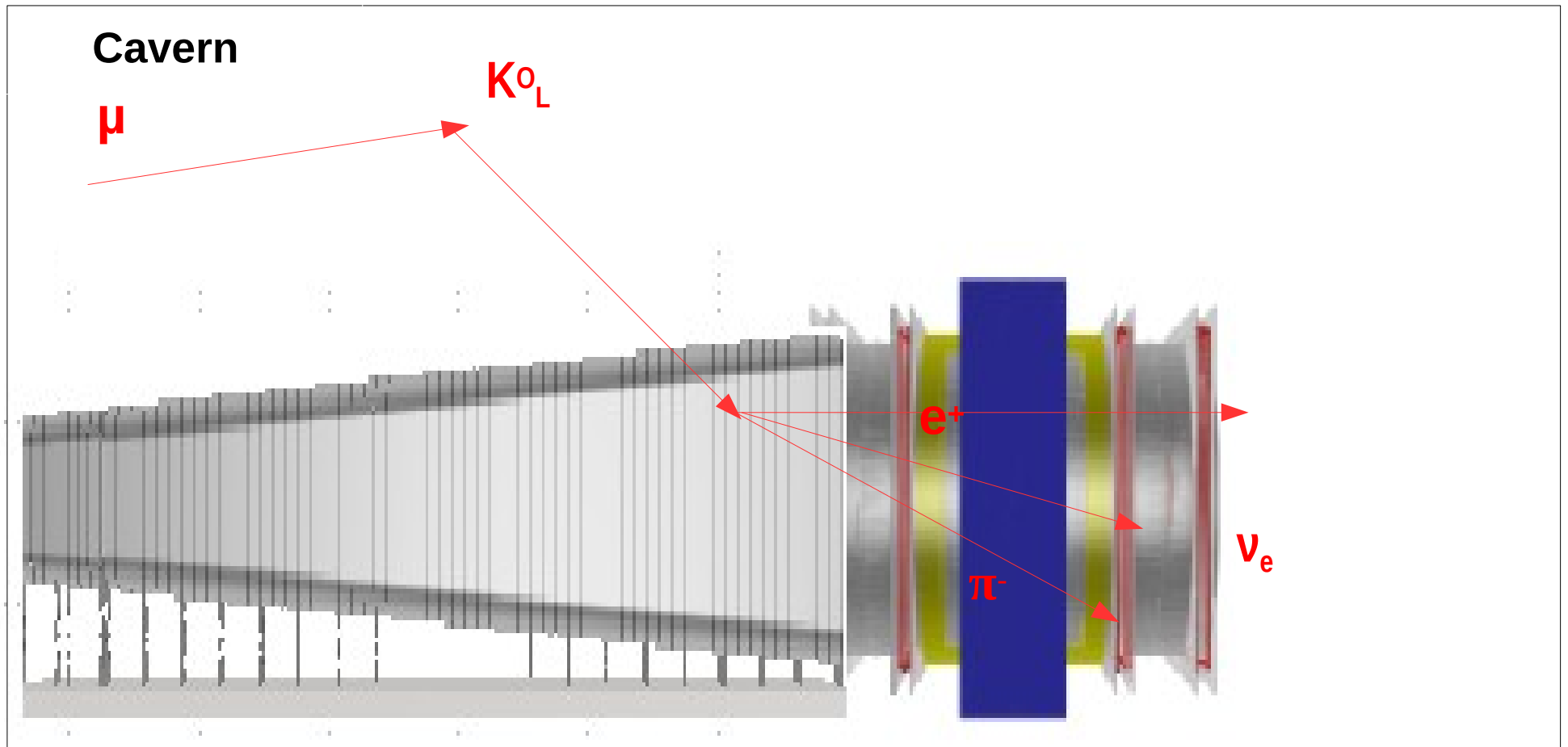
# DIS with Muons hitting the Vessel



## Stages of simulation

2. Generate interactions between muons and p,n (50%/50%)
3. Distribute interactions according to the material in the Decay Vessel (most intensive step)
  - Distribute interaction points along extrapolated trajectory of incoming muon
  - Weighted by the material along the trajectory

# DIS with Muons hitting the Cavern



# DIS with Muons hitting the Cavern



**Strategy - estimate the number of particles produced in DIS reaching vessel , spectrometer , SBT ( $N_{\text{vessel}}$  ,  $N_{\text{spectrometer}}$  ,  $N_{\text{SBT}}$  )**

$$N_{\text{vessel}} \sim N_{\text{cavern}} \times N_{\text{DIS}} \times \text{Probability of DIS products for scatter by large angle}$$

## **Steps to be done:**

1. Estimate the number of DIS event ( $N_{\text{DIS}}$  )

→ Find the Hit Rate of muons in the Cavern ( $N_{\text{cavern}}$ ) (perform normal Background simulation)

→ Find the ratio of Elastic scattering event to the Inelastic

→ Scale this ratio using the hit rate in the Cavern

# DIS with Muons hitting the Cavern



## Steps to be done:

2. To Find the number of particles scattered back in the spectrometer

- Generated individual  $\mu$ -p and  $\mu$ -n interactions ( look into the angular distribution , momentum distribution ..)
- Using the probabilities to estimate number of particles in the Spectrometer