

# Simulations for WCTE experiment

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Experimental particle physics and astrophysics, Masters programme 1st  
year



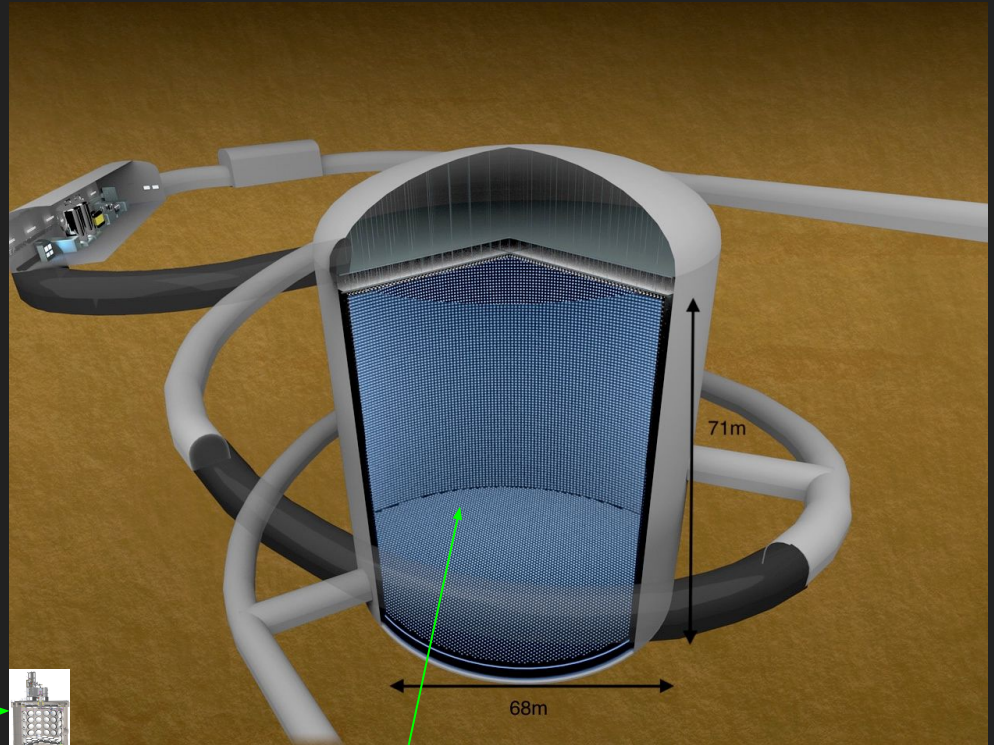
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# WCTE experiment

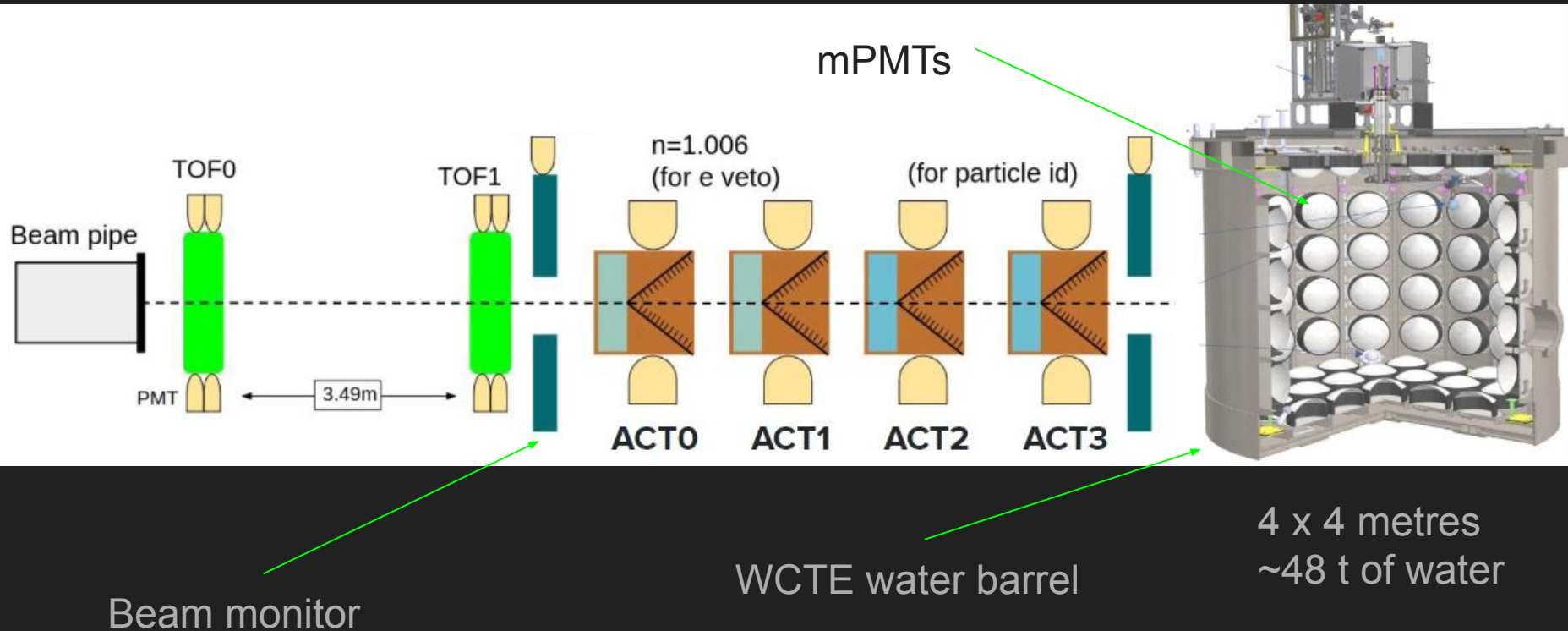
- CERN neutrino experiment
- Testing technologies for upcoming HyperK experiment
- Response of detectors to pions, muons, electrons, etc.
- $\sim 200$  to  $1100$  MeV/c momentum range

WCTE barrel - comparison



Hyper Kamiokande water tank - 260 kt of water

# WCTE setup

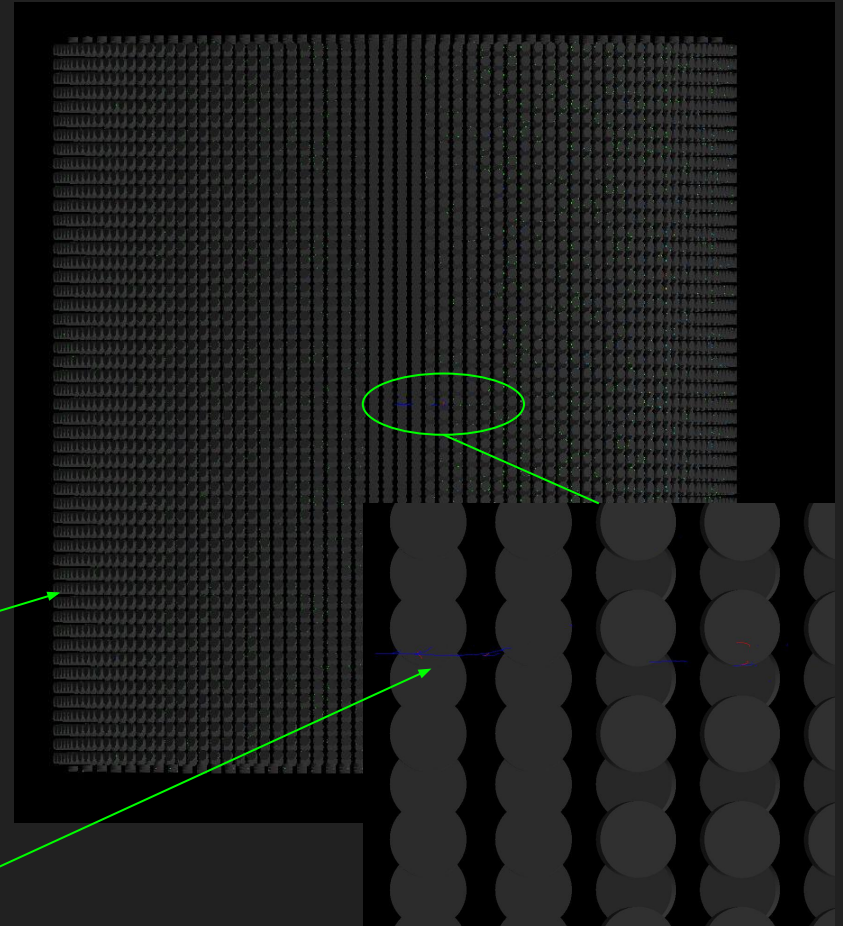


# Simulations

- Software package for simulations WCSim
- Built on Geant4 and ROOT
  - C++
- Applied in Water Cherenkov experiments

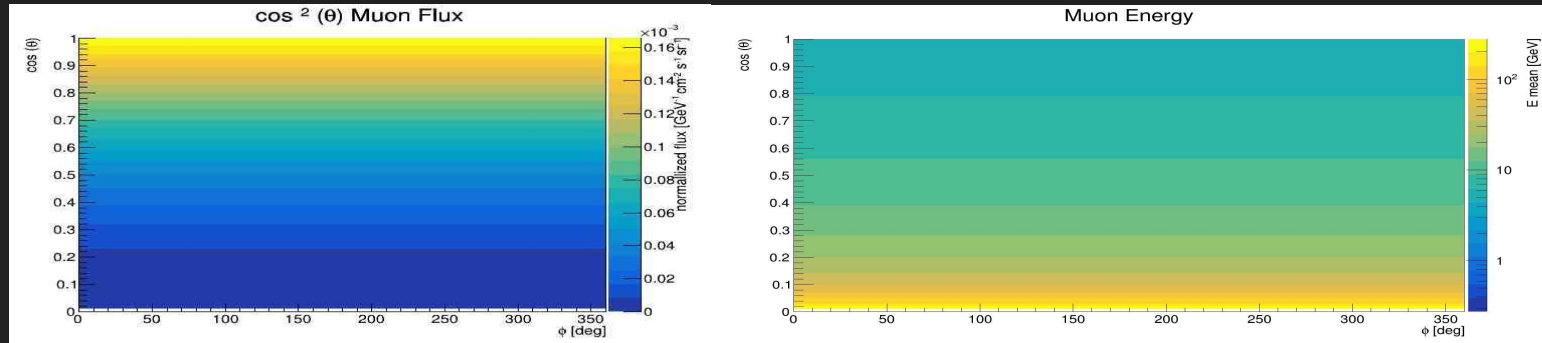
SuperK barrel PMTs

Electron trace



# My work (so far)

- Creating a proper WCSim macro to generate cosmic rays in WCTE barrel
- Cosmic muons - detector calibration, possible background
- Research of sea level cosmic muons flux and energies
- 2D histogram generation - flux and energy on incident angle



- Conversion to data file and simulation testing

# Much more to do, i.e. next plans

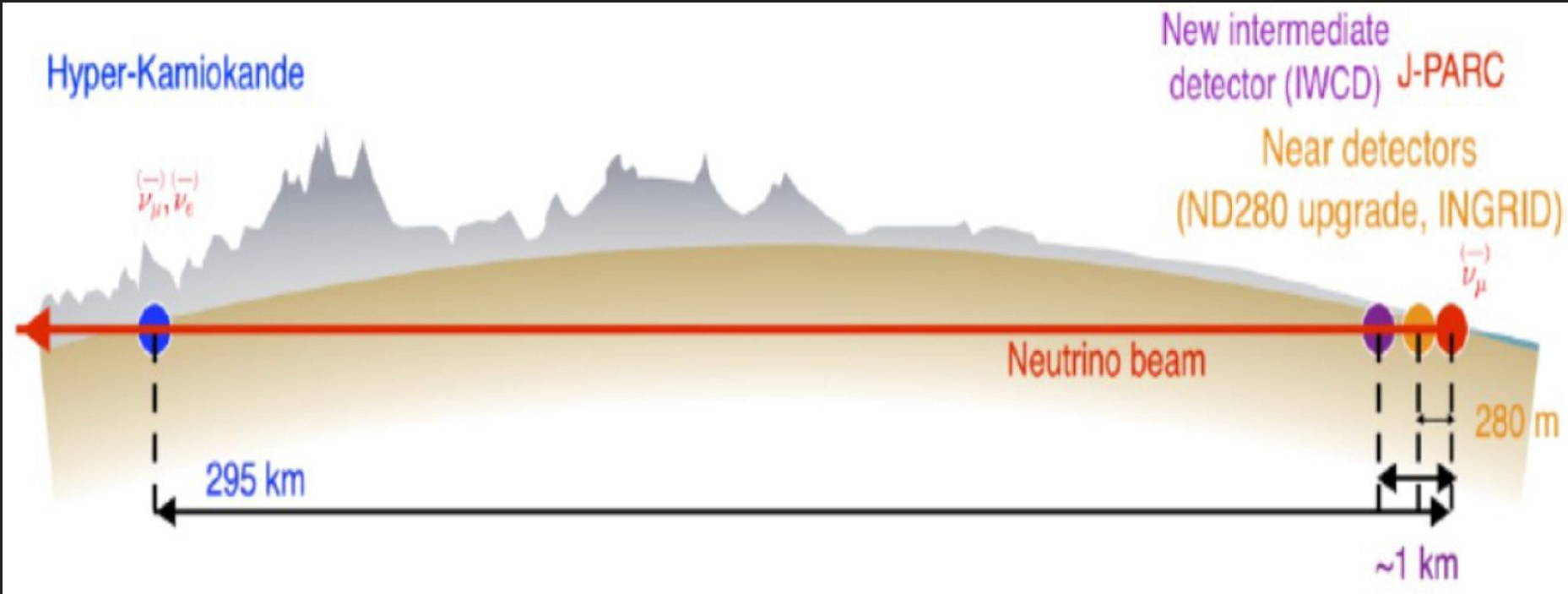
- Use macro to generate PMT response and test particle reconstruction on cosmic muons
- Make a simulation of new TOF detector and create a function that could be used for beam tracking

Thank you for your attention

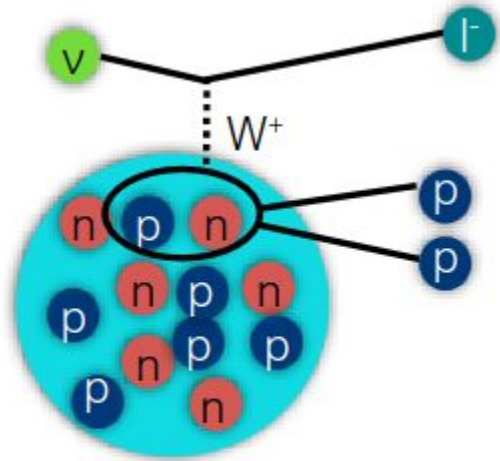
Backup slides



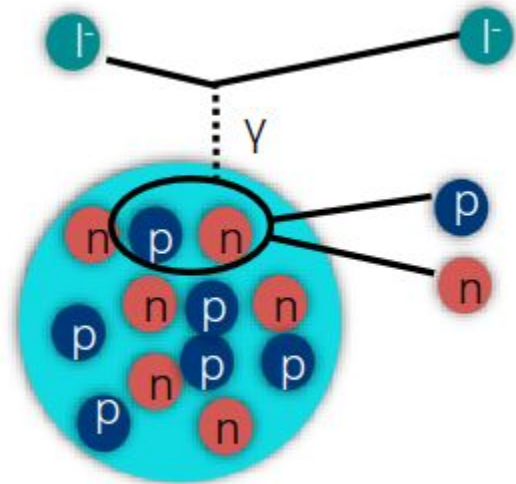
# Hyper Kamiokande beamline



# Particle Interactions

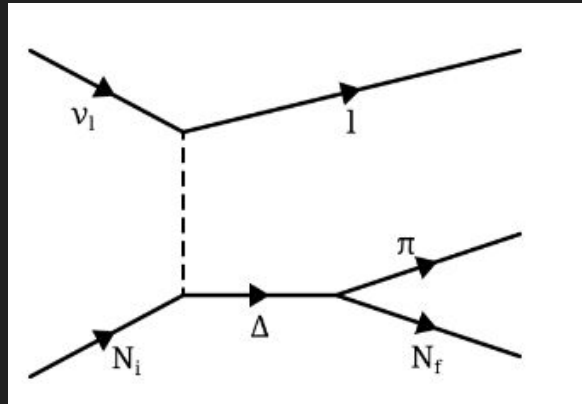


Neutrino-nucleus scattering

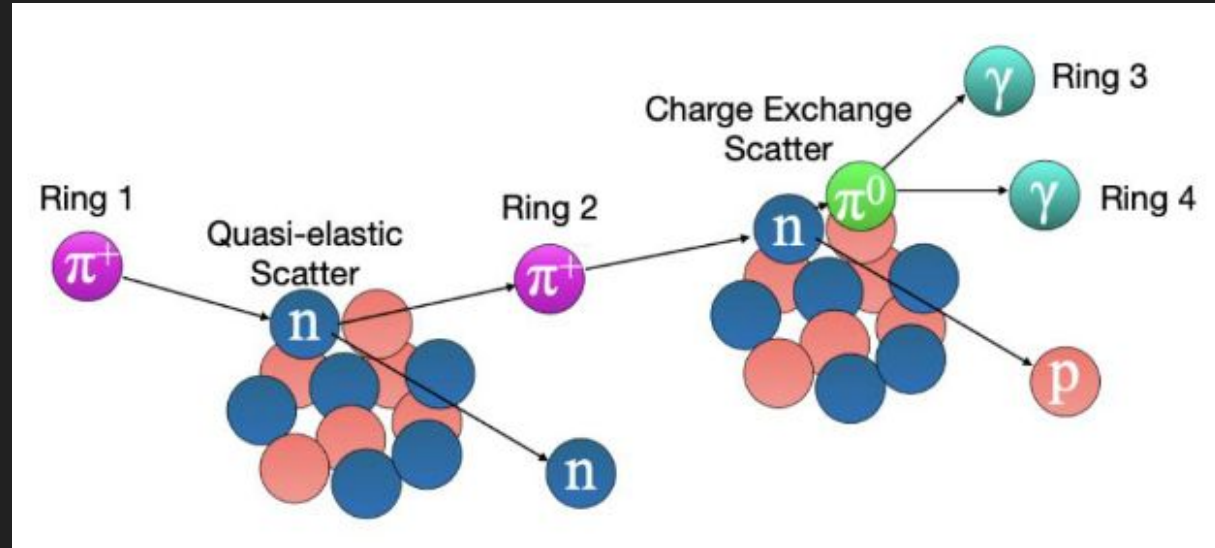


electron/muon-nucleus scattering

# Particle Interactions



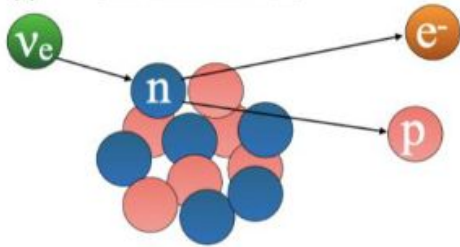
Pion production in neutrino interaction



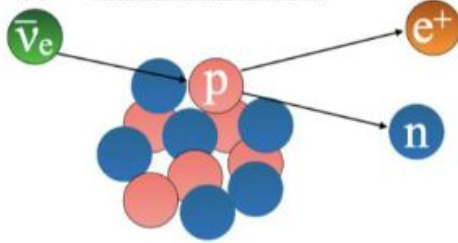
Pion scattering

# Particle Interactions

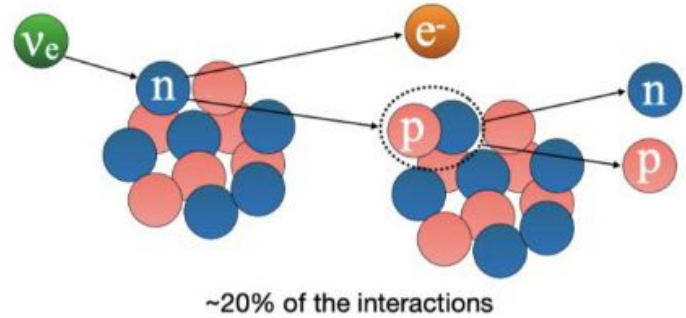
(a) Neutrino CCQE:



(b) Antineutrino CCQE:



(c) Secondary Interaction:



neutron/proton production,  
scattering

# Flux and energy histogram of sea level cosmic muons

