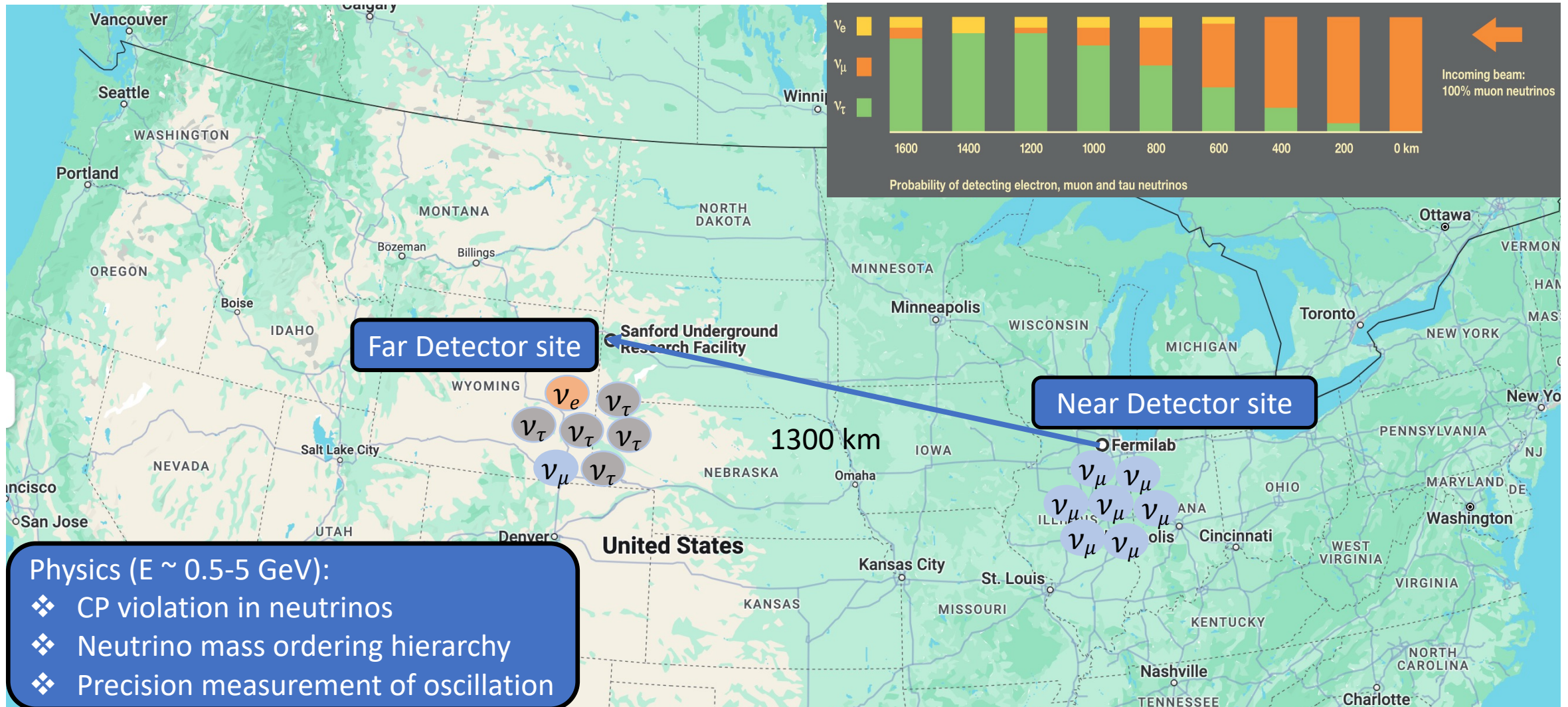


The Deep Underground Neutrino Experiment (DUNE)

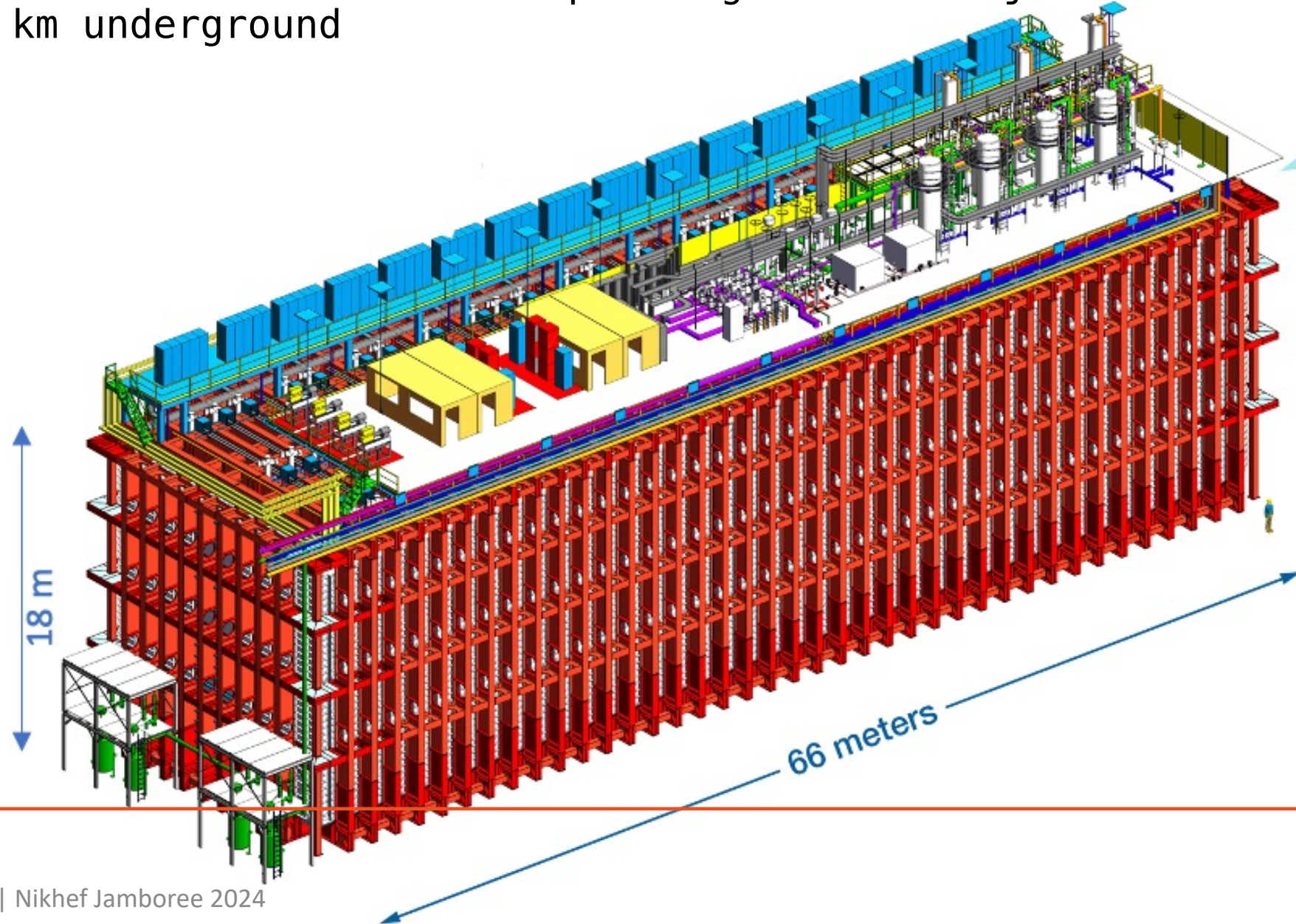
Vikas Gupta

UvA/Nikhef

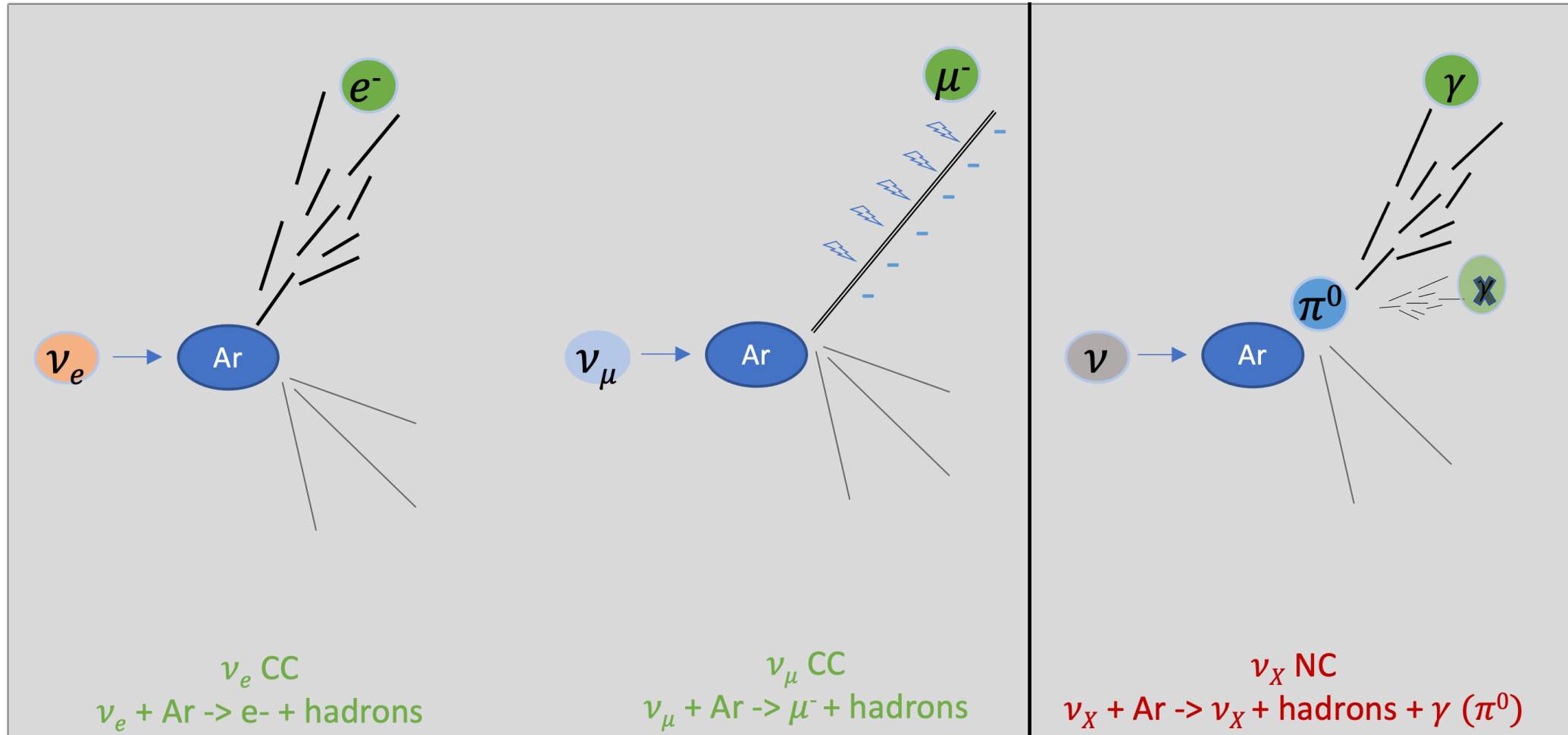
DUNE: measuring $\nu_\mu \rightarrow \nu_e$ oscillations with a 1300 km baseline



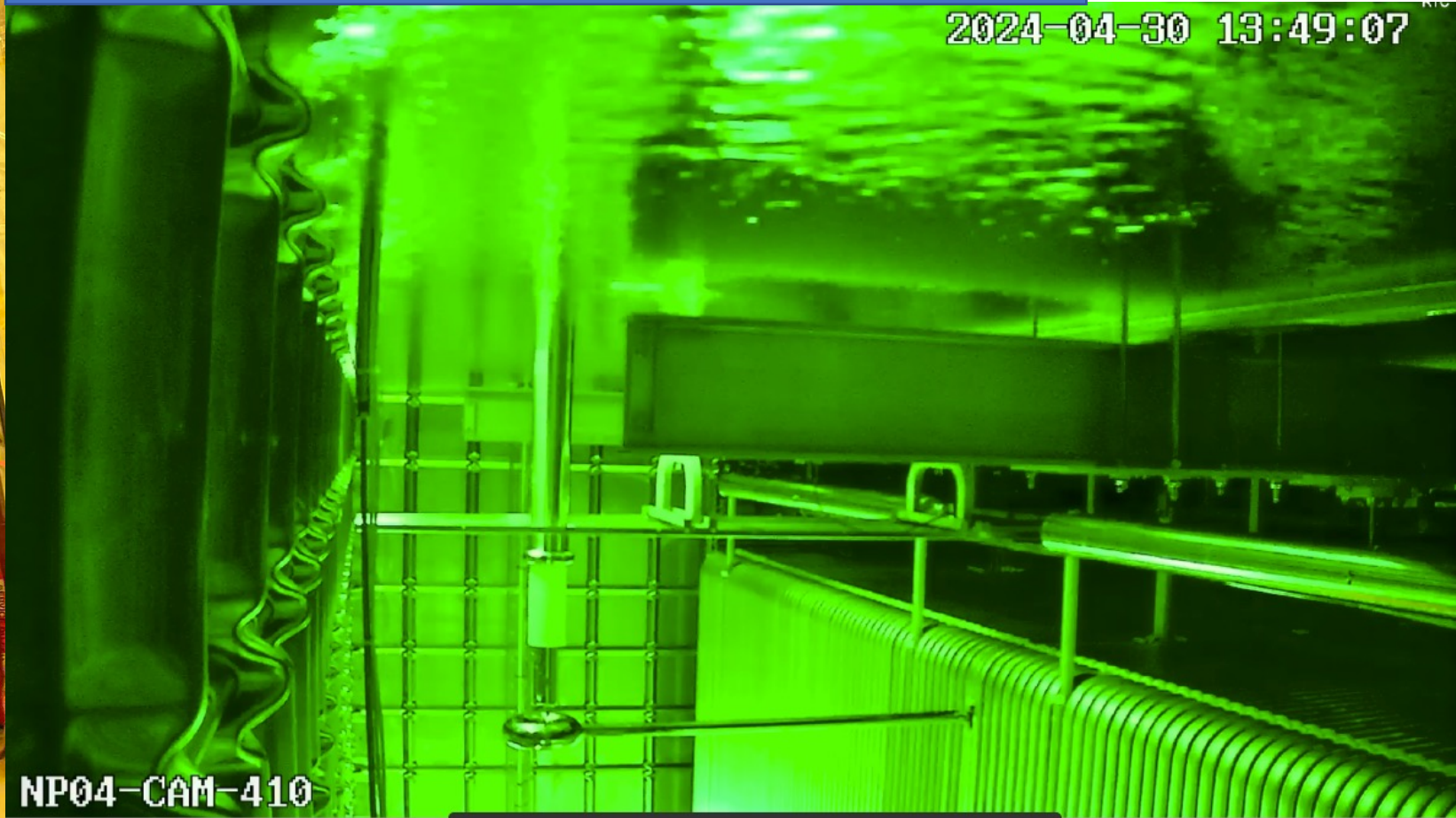
DUNE Far Detector: four 17 kt Liquid Argon Time Projection Chamber kept 1.5 km underground



DUNE: signal and background definition



Activities @Nikhef

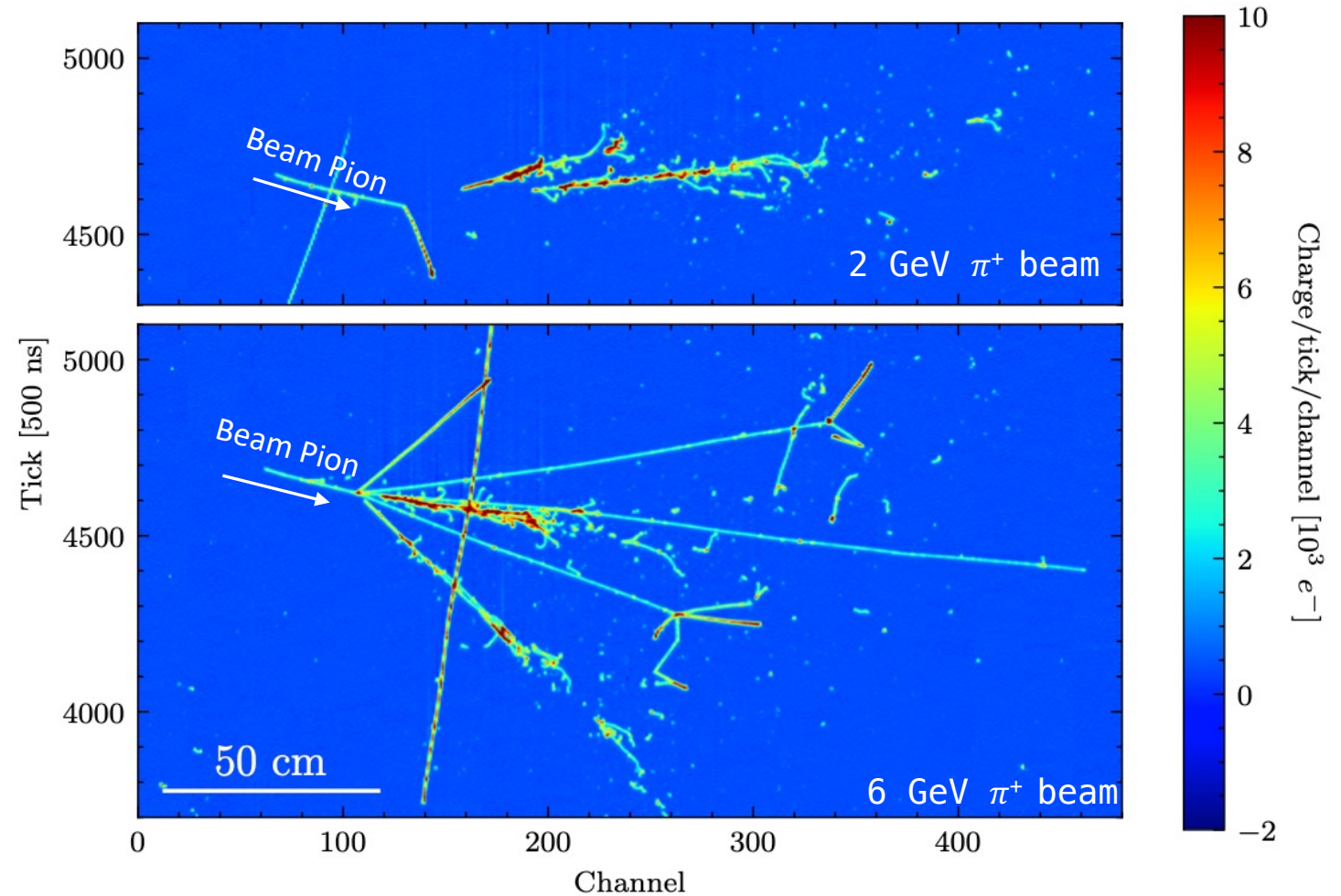


Aug 2022

1) ProtoDUNE

R&D program at CERN to develop the Far Detector technology using two ~ 800 ton LArTPC detectors

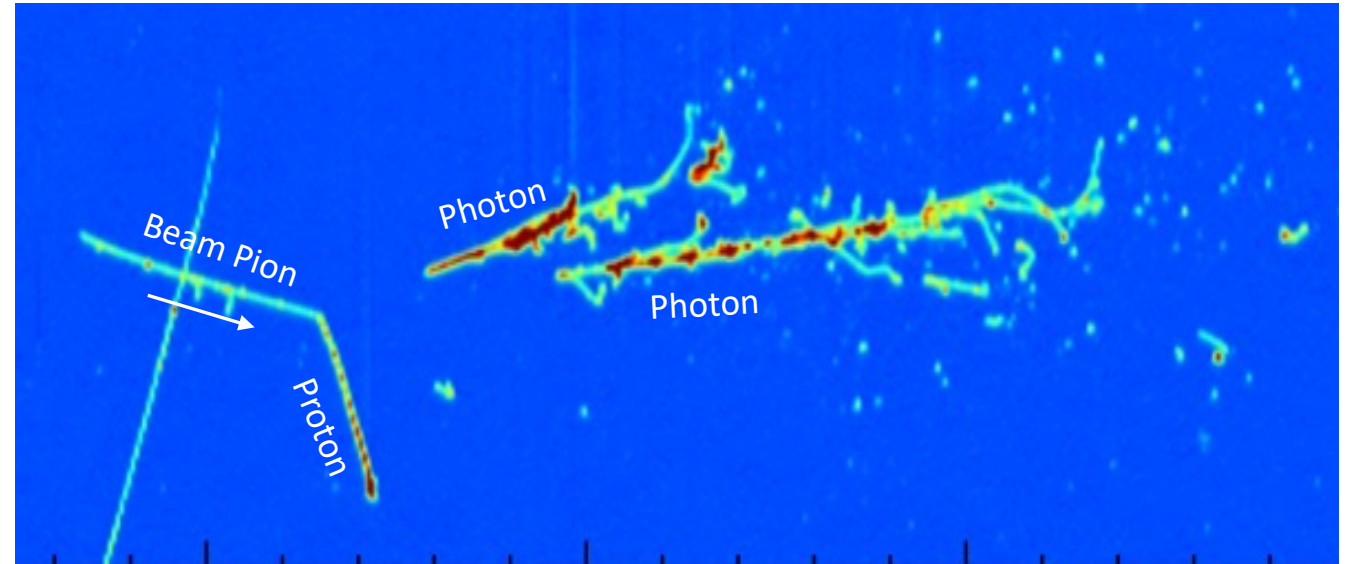
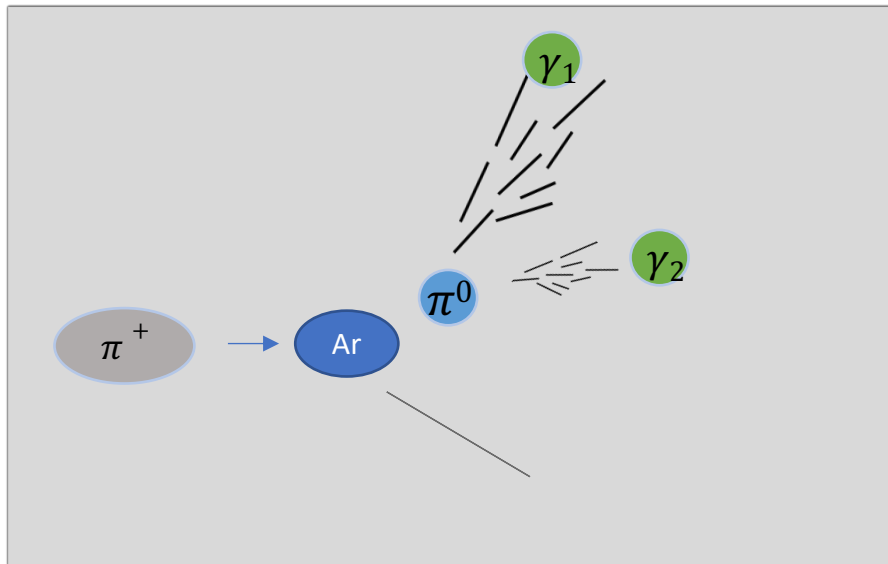
- ❖ ProtoDUNE data analysis
 - ❖ Particle identification & reconstruction
 - ❖ π^+ -Ar cross section measurements
- ❖ ProtoDUNE II construction & operation

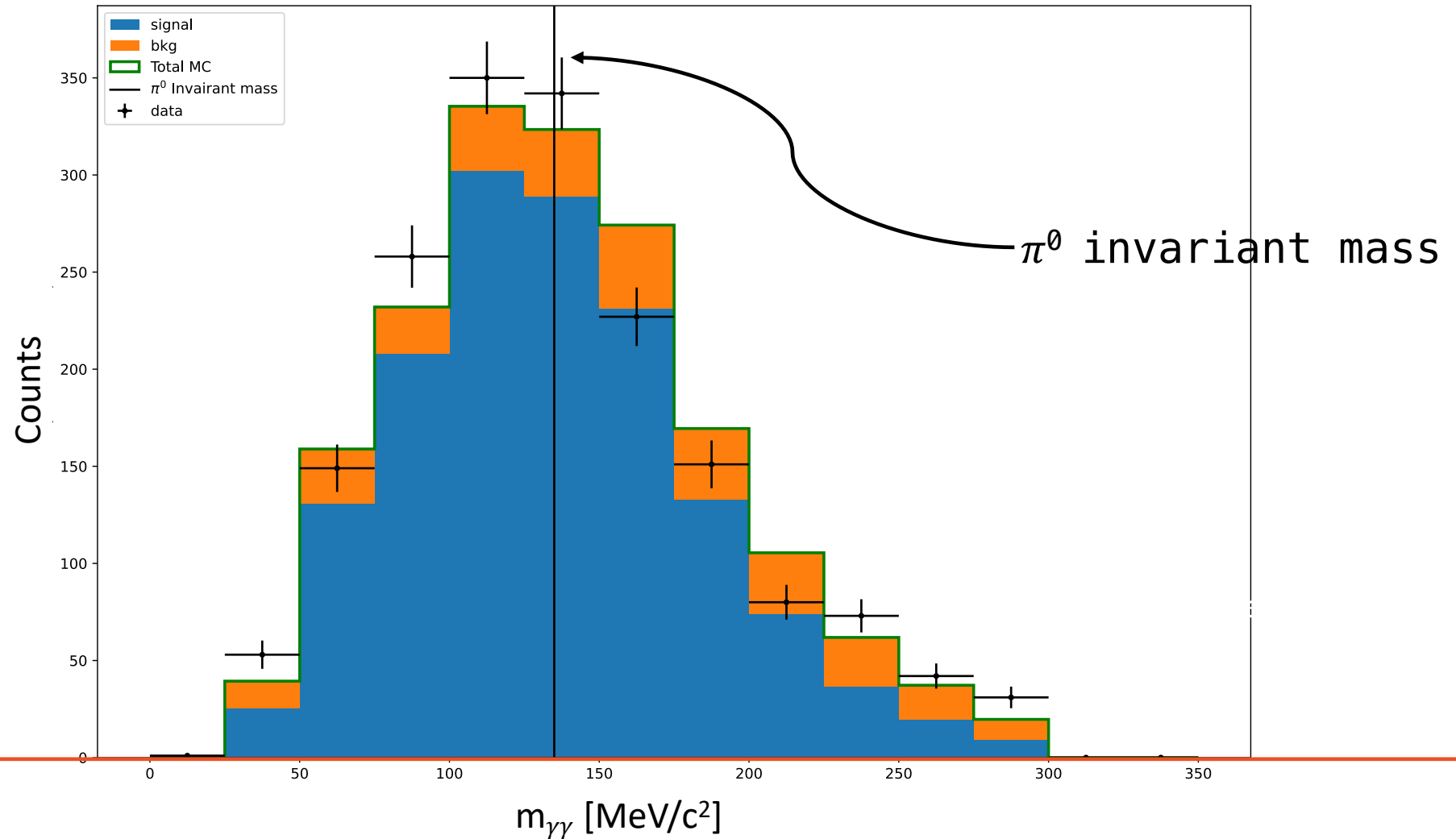


Data taken with charge particle beam during ProtoDUNE I in 2018

Electromagnetic shower (γ/e^-) reconstruction

- ❖ To estimate the ν energy, we must correctly reconstruct all daughter particles
- ❖ π^0 's decay to two photons \rightarrow we can look at π^0 reconstruction in ProtoDUNE data to test EM shower reconstruction performance of DUNE

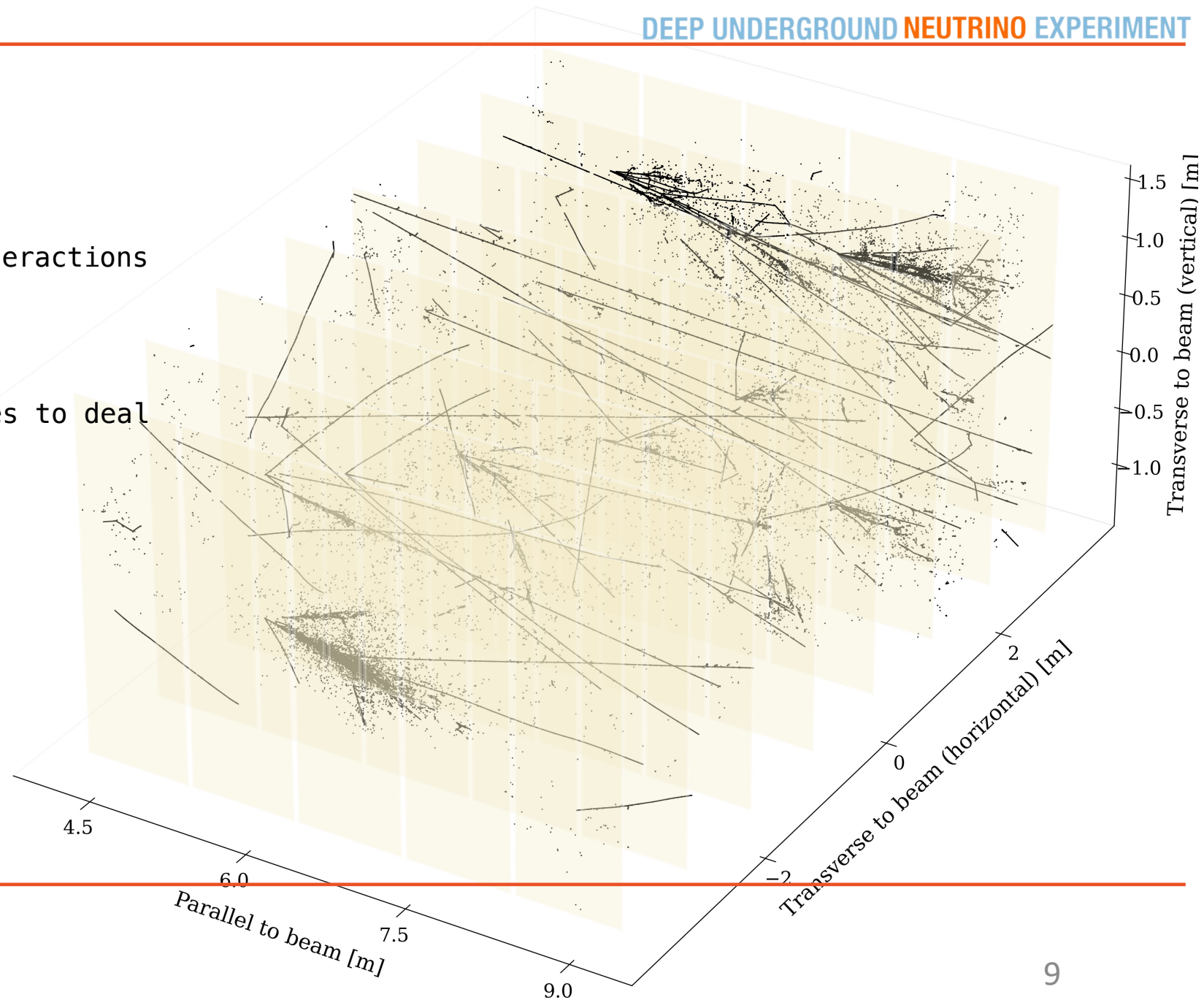


Electromagnetic shower (γ/e^-) reconstruction

2) Near Detector

The Near Detector will see ~ 50 ν interactions
in a $10 \mu\text{s}$ window

35 optically segmented LArTPC modules to deal
with the **neutrino event pileup**



2) Near Detector

The Near Detector will see $\sim 50 \nu$ interactions in a $10 \mu\text{s}$ window

35 optically segmented LArTPC modules to deal with the **neutrino event pileup**

- ❖ Near detector prototype test @2024 using ν beam at Fermilab
- ❖ R&D of the scintillation light readout at Nikhef with the ET department



The Nikhef DUNE group



Paul de Jong



Tina Pollmann



Patrick Decowski



Frank Filthaut



Auke Pieter Colijn



James Mead



Vikas Gupta Marjolein van Nuland-Troost



Wessel Krah



Jasper Paul



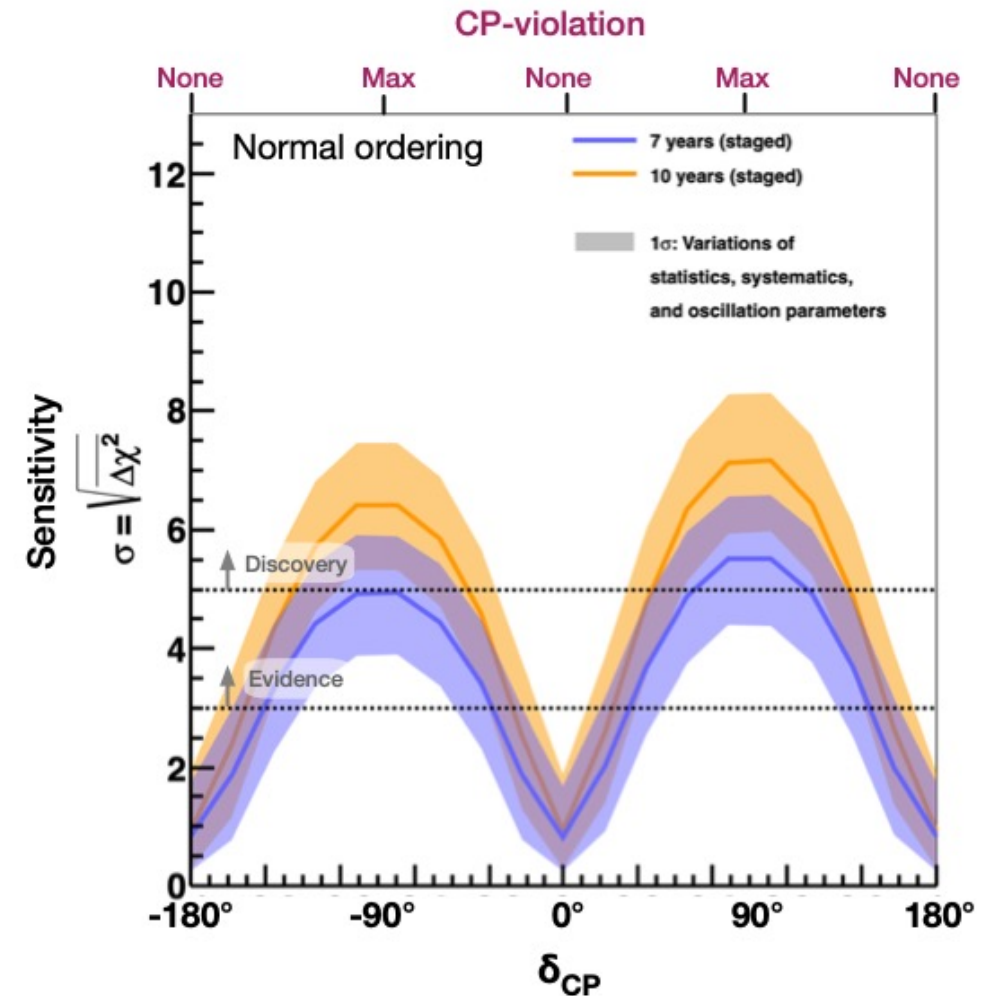
Corryenne Groen



Dagmar Salomons

Future

- ❖ ProtoDUNE-II will take data from June 2024
- ❖ The DUNE-ND is reaching the critical phase of R&D, and Nikhef will significantly contribute to the scintillation light readout in the coming year



2024

2028

2031

R&D and
construction

First two FD modules
are operational

Beam and ND are
ready