Informal discussions about nu-nucleus scattering

Tuesday 9 May 2017, 09:30 → 16:05 Europe/Zurich

160-1-009 (CERN)

Albert De Roeck/EP-NU

9th May2017

WELCOME!

Many thanks to Stefania and Sarah to initiate this !

CERN EP-NU Group

EP-nu: about 20 people.
- Many of these full time on detector challenges
- About 10 (part time) for physics/analysis

Neutrino Group in EP

Established September 1st, 2016

Neutrino Group EP-NU (https://ep-dep.web.cern.ch/organisation/nu)

Interim Group Leader: **Manfred Krammer**
Deputy Group Leader: **Albert De Roeck**

Excerpt form the Mandate (full mandate in backup slides):

- Act as focal point for the activities of the accelerator-based experimental neutrino community in Europe, in close connection with the activity in the TH Department.
- Coordinate contributions from EP-NU and other EP groups, such as the support groups (DT, ESE, SFT), to the Neutrino Platform projects.
- Coordinate, together with the Project Leader of the Neutrino Platform, CERN's participation in those experiments that CERN joins as a collaborating institute (currently ICARUS and DUNE).

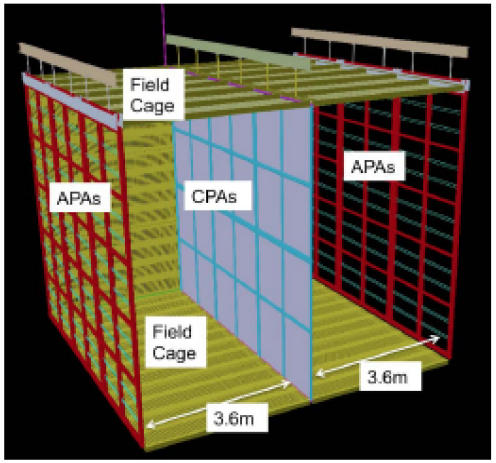
EP–NU group & the neutrino experiments
Presently: DUNE (FNAL) & ProtoDUNE (CERN)
FNAL short baseline (ICARUS)
Under study: T2K upgrade

In TH Department
TH-NU Initiative

ProtoDUNE

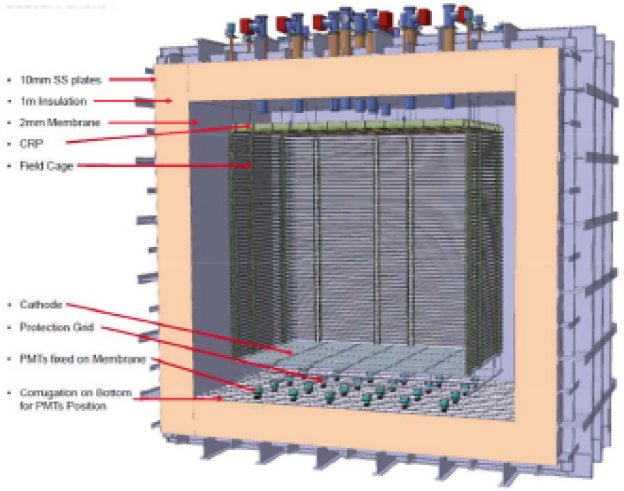
ProtoDUNE **Full-scale** engineering prototypes for far detectors

Test of component installation, commissioning, and performance
Also important for tests of FD calibration and reconstruction software tools



ProtoDUNE-SP: 7x7x6 m^3

Single phase: full-sized APAs and CPAs, full drift distance and E field



ProtoDUNE-DP: 6x6x6 m^3

Dual phase: full-sized readout/cathodes, half drift distance, operating at full and double E field

- ✓ Learning how to built, maintain and operation the large-scale prototypes are important ingredients of the DUNE program
- ✓ Understand production as well as operational issues
- ✓ Provides training and opportunities for Test Beam data analyse

Involved in beam-line, simulation, reconstruction computing, monitoring tools, detector work packages…

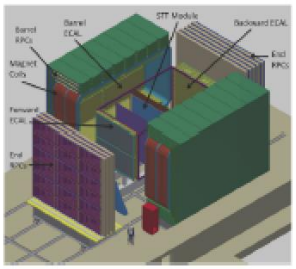
- Testing reconstruction
- Pion-Ar measurements
- Other measurements?

The DUNE Experiment

DUNE/LBNF

New beam at Fermilab (1.2 MW@120 GeV protons, upgradeable to 2.4 MW), 1300 km baseline

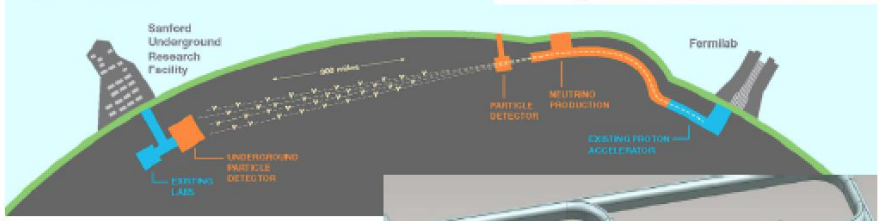
10^{21} protons on target per year.

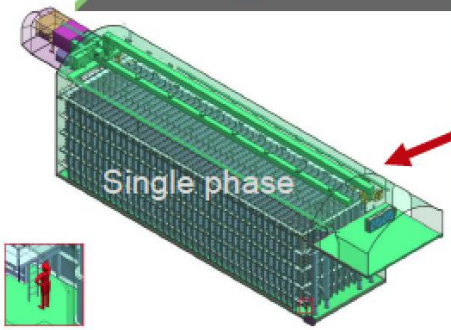


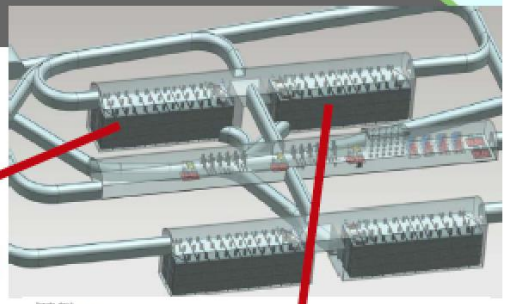
Highly-capable near detector at Fermilab

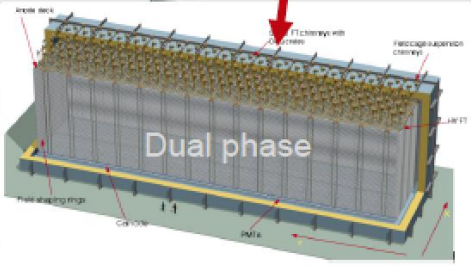
946 collaborators from 161 institutions in 30 nations

DEEP UNDERGROUND NEUTRINO EXPERIMENT









• On-Axis 4 x10 kton Liquid Argon Time Projection Chamber (LArTPC) Far Detector at Sanford Underground Research Facility, South Dakota, 1.5 km underground

- ν_e appearance and ν_μ disappearance => Measure MH, CPV and mixing angles
- Large detector, deep underground => Nucleon decay and supernova burst neutrinos

- Physics TDR of DUNE (2017-2018)
- Studies for optimizing the Near Detector of DUNE

In the best of worlds…

Timeline

DUNE Near Detector

- **Major milestones/steps**
  - Mar 2017: 3-day DUNE ND Workshop 27th-29th March at FNAL
    - **open to all interested parties, not just DUNE collaboration**
  - May 2017: agree on 2 [or 3] options to pursue
  - Jun 2017: 3-day DUNE ND Workshop to review and document pros/cons of each option and assumed funding model
  - Aug 2017: presentation of options at collaboration meeting and possible down select
  - By the end of 2017: concept agreed by collaboration

ND Concept Study

  - Early 2018: "Expressions of Interest" in ND construction
    - **start to identify institutional/national responsibilities**
  - By the end of 2018: ND CDR (could be updated FGT CDR)
  - By early of 2020: ND TDR for CD-3C review in August

ND Design

CERN can assist in coordinating European interests in ND (DUNE…)

Interest at CERN in the Topic of Today

- EP-NU and EP-TH groups specific interests in neutrino physics
  - EP-TH organizes TH institutes/first one end of March 2017
- ProtoDUNE for hadron-nucleus interaction measurements (2018)
- NA61/Shine experiment (?) (AA and pA)
- Today we explore the phase space to think of engagement and collaboration
- In future CERN can act as a facilitator for future complete workshops