ArgonCube and the DUNE ND

A.Ereditato – Univ. Bern

Letter of Intent

ArgonCube: a Modular Approach for Liquid Argon TPC Neutrino Detectors for Near Detector Environments

C. Azevedo, A. L. Silva, J. Veloso
I3N, Physics Department, University of Aveiro, 3810-193 Aveiro, Portugal

T. Gamble, N. McConkey, N. J. C. Spooner, M. Thiesse, M. H. Wright
University of Sheffield, Western Bank, Sheffield S10 2TN, UK

J. Bremer, U. Kose, D. Mladenov, M. Nessi, F. Noto
European Organization for Particle Physics (CERN), Geneva, Switzerland

M. Auger, Y. Chen, A. Ereditato[a], D. Göldi, R. Hänni, I. Kreslo[b], D. Lorca, M. Lüthi, P. Lutz, J. R. Sinclair[c], M. Weber
Albert Einstein Center for Fundamental Physics (AEC) - Laboratory for High Energy Physics (LHEP), University of Bern, Bern, Switzerland

D. Bleiner, A. Borgschulte
Swiss Federal Laboratories for Materials and Technology (EMPA), CH-8600 Dübendorf, Switzerland

M. Zeyrek
Middle East Technical University (METU), TR-06800, Ankara, Turkey

F. Bay
TUBITAK Space Technologies Research Institute (TUBITAK UZAY), METU Campus, TR-06800, Ankara, Turkey

N. Anfimov, A. Olshevskiy, A. Selyunin, S. Sokolov, A. Sotnikov
Joint Institute for Nuclear Research (JINR), Joliot-Curie 6, 141980 Dubna, Moscow region, Russia

D. A. Dwyer, D. Gnani, C. Grace, S. Kohn, M. Kramer, A. Krieger, K. B. Luk, P. Madigan, C. Marshall
University of California and Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA

M. Convery, Y-T. Tsai, T. Usher
SLAC National Accelerator Laboratory, 2575 Sand Hill Rd, Menlo Park, CA 94025, USA

M. Mooney
Colorado State University, Fort Collins, CO 80523, USA

J. Asaadi, H. Sullivan
University of Texas at Arlington, 701 S Nedderman Dr, Arlington, TX 76019, USA

K. Cankocak, J. Nachtman, Y. Onel, A. Penzo
University of Iowa High Energy Physics Group, Iowa City, IA 52242, USA

A. Marchionni, O. Palamara, J. L. Raaf, G. P. Zeller
Fermi National Accelerator Laboratory (FNAL), Batavia, IL 60510 USA

M. Soderberg
Syracuse University, Syracuse, NY 13210, USA

M. Bishai, H. Chen, M. Diwan, F. Lanni, Y. Li, D. Lissauer, X. Qian, V. Radeka, B. Yu
Brookhaven National Laboratory (BNL), Upton, NY 11973-5000, USA

B. Fleming, S. Tufanli
Yale University, Wright Laboratory, New Haven, CT 06520 USA

R. Guenette
Harvard University, Cambridge, MA 02138, USA

C. Kuruppu, S. R. Mishra, R. Petti
University of South Carolina, 712 Main Street, Columbia, SC 29208 USA

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LAr for a DUNE ND

Kam-Biu Luk (University of California at Berkeley & LBL)
Alfons Weber (University of Oxford & STFC/RAL)

Status of the DUNE ND Concept Study
Bern, Oct-2017



Science & Technology Facilities Council
Rutherford Appleton Laboratory


Current Status

- There is consensus to have a LAr TPC near detector
  - It will not be magnetized
  - The size is likely 3x3x4 m^3 (to be optimized for physics and hall-size constraints).
- In addition, there will be a multi-purpose tracking (MPT) detector.
  - It should be magnetized.
  - The most likely options for the tracking technology are believed to be either a straw-tube tracker (STT) or a high-pressure (argon-gas) TPC.
- Timeline (to be confirmed soon)
  - Decision on ND concept (first half of 2018)
  - CDR draft (early 2019)
  - TDR draft (early 2020)

ND Convenors Statement

- We are committed to is to have a functional LAr component for the Near Detector.
- The ArgonCube concept seems (at this stage) to be the leading candidate for this detector.
- We are fully supportive of ArgonCube R&D dedicated toward producing a realistic detector design that can work well as part of the DUNE ND.

- DUNE leadership has sent a Letter of Support for ArgonCube to Antonio expressing similar views.

DEEP UNDERGROUND NEUTRINO EXPERIMENT

16th September 2017

Dear Professor Ereditato,

As Co-Spokespersons of the DUNE experiment, we would like to express our support for the ongoing R&D for the ArgonCube concept for a modular Liquid Argon Time Projection Chamber (LAr-TPC).

The DUNE collaboration has not yet defined the concept for the Near Detector, but the scientific case for a hybrid system comprising a LAr-TPC and fine-grained tracker system is widely accepted; it will almost certainly form the basis for the concept taken forward to a conceptual design report.

ArgonCube provides an attractive solution that combines 3D readout with relatively short drift distances, both necessary requirements to operate in the high-multiplicity environment of the DUNE near detector.

For the above reasons, we are writing on behalf of the DUNE collaboration to express strong support for the development activities proposed by the institutions working on ArgonCube.

Yours sincerely,

Professor Edward C. Blucher

Professor Mark A. Thomson

LAr Questions

- Before a decision in principle can be made the following questions/issues need to be addressed
  - What is the additional facility cost for a LAr detector?
  - Can the LAr detector handle the high rate?
  - The feasibility of the pixel readout needs to be demonstrated.
- The answers to the following questions might influence the detailed design
  - Can the active volume height be increased? (Hall height)
  - Can neutrino electron scattering be measured?
  - What size is needed for hadron containment?
  - Is a side muon spectrometer needed?
  - What is the statistics in the fiducial volume?
  - What is the muon acceptance for LAr interactions for the different tracker options?