



Fermi National Accelerator Laboratory
INTENSE Interim Review Meeting, December 2, 2022
E. Barzi, S. Donati



Fermilab is America's particle physics and accelerator laboratory

We bring the world together to solve the mysteries of matter, energy, space and time.



Wilson Hall

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Fermilab at a glance

America's Particle Physics and Accelerator Laboratory


As the United States' premier particle physics laboratory, we do science that matters.

FERMILAB PROCUREMENT FY18
\$183 M⁺
U.S. SPENDING

\$63 M⁺
ILLINOIS SPENDING

\$58 M⁺
SMALL BUSINESS CONTRACTS

USER FACILITIES
Fermilab Particle Accelerator Complex
U.S. Hub for the CMS Experiment at the Large Hadron Collider at CERN



FOR MORE INFORMATION
Email: fermilab@fnal.gov
www.fnal.gov


\$437 M BUDGET IN FY18

MAJOR PARTNERSHIPS

- Deep Underground Neutrino Experiment**
World's flagship neutrino experiment with more than 1,000 scientists from over 30 countries
- PIP-II particle accelerator**
215-meter-long particle accelerator to be constructed at Fermilab with major international contributions
- LCLS-II X-ray Laser**
Design and construction of 19 superconducting cryomodules needed for the LCLS-II X-ray laser at DOE's SLAC laboratory
- Quantum Science**
Apply expertise and knowledge in quantum systems in collaboration with industry and other research institutions

4,800⁺

Employees, scientists from across the U.S. and over 50 countries use Fermilab's accelerators, detectors and computing facilities each year



31,000⁺ Students in K-12 programs	2,300⁺ PhDs based on research at the lab	230⁺ Teachers attending workshops
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FLAGSHIP LBNF / DUNE PROJECT

\$1 B⁺ ECONOMIC OUTPUT

Estimates based on first decade of planning, construction and operations

\$500 M⁺ LOCAL EARNINGS	\$20 M⁺ ILLINOIS TAX REVENUE
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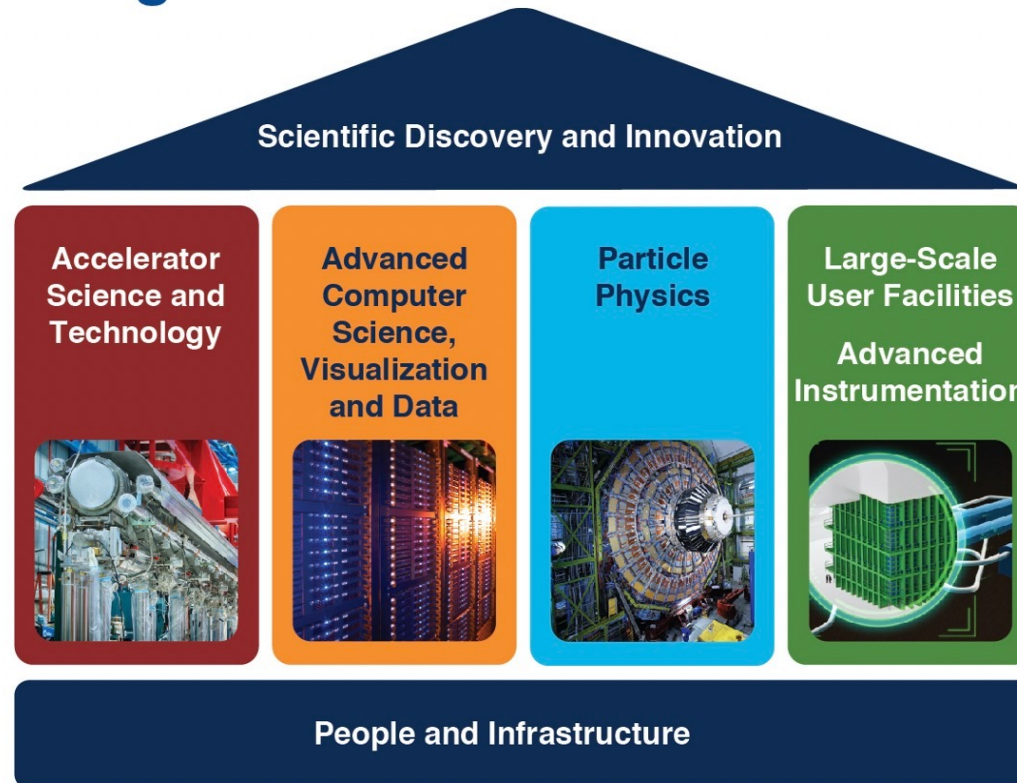
6,800 acres

including restored, tall-grass prairie

Celebrating **50** years of science & technology

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Fermilab Program



Make the best use of lab core capabilities + people + infrastructure to strengthen the field of particle physics in the U.S. and host the world to advance scientific discovery and innovation

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Long-standing European collaboration with Fermilab

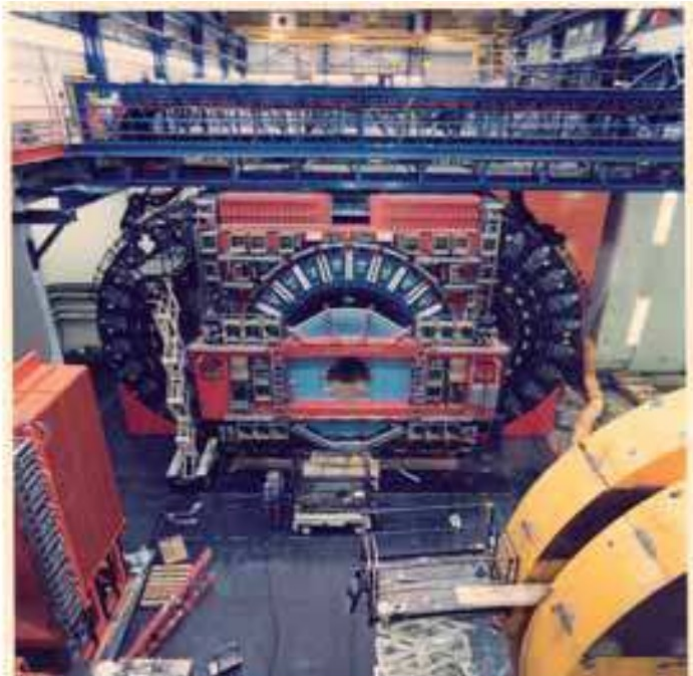
Observation of Top Quark Production at CDF and D0 (1995)

VOLUME 74, NUMBER 14

PHYSICAL REVIEW LETTERS

3 APRIL 1995

CDF Detector



Observation of Top Quark Production in $\bar{p}p$ Collisions with the Collider Detector at Fermilab

F. Abe,¹⁴ H. Akimoto,³² A. Akopian,²⁷ M. G. Albrow,⁷ S. R. Amendolia,²⁴ D. Amidei,¹⁷ J. Antos,²⁹ C. Anway-Wiese,⁴ S. Aota,³² G. Apollinari,²⁷ T. Asakawa,³² W. Ashmanskas,¹⁵ M. Atac,⁷ P. Auchincloss,²⁶ F. Azfar,²² J. C. Yun,⁷ A. Zanetti,²⁴ F. Zetti,²⁴ L. Zhang,³⁴ W. Zhang,²² and S. Zucchelli²

(CDF Collaboration)

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²Istituto Nazionale di Fisica Nucleare, University of Bologna, I-40126 Bologna, Italy

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⁴University of California at Los Angeles, Los Angeles, California 90024

⁵University of Chicago, Chicago, Illinois 60637

⁶Duke University, Durham, North Carolina 27708

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⁸Laboratori Nazionali di Frascati, Istituto Nazionale di Fisica Nucleare, I-00044 Frascati, Italy

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¹⁵Lawrence Berkeley Laboratory, Berkeley, California 94720

¹⁶Massachusetts Institute of Technology, Cambridge, Massachusetts 02139

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¹⁸Michigan State University, East Lansing, Michigan 48824

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²²University of Pennsylvania, Philadelphia, Pennsylvania 19104

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²⁴Istituto Nazionale di Fisica Nucleare, University and Scuola Normale Superiore di Pisa, I-56100 Pisa, Italy

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²⁶University of Rochester, Rochester, New York 14627

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²⁸Rutgers University, Piscataway, New Jersey 08854

²⁹Academia Sinica, Taipei, Taiwan 11529, Republic of China

³⁰Texas A&M University, College Station, Texas 77843

³¹Texas Tech University, Lubbock, Texas 79409

³²University of Tsukuba, Tsukuba, Ibaraki 305, Japan

³³Tufts University, Medford, Massachusetts 02155

³⁴University of Wisconsin, Madison, Wisconsin 53706

³⁵Yale University, New Haven, Connecticut 06511












(Received 24 February 1995)

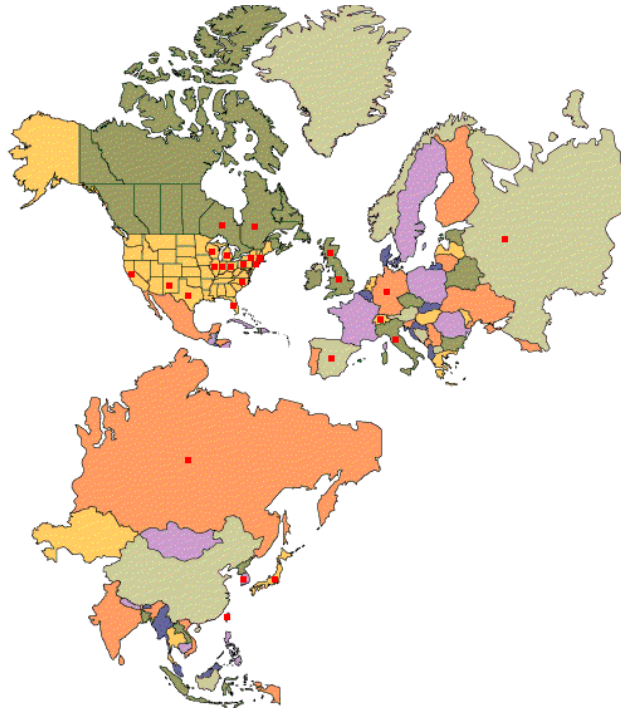
We establish the existence of the top quark using a 67 pb^{-1} data sample of $\bar{p}p$ collisions at $\sqrt{s} = 1.8 \text{ TeV}$ collected with the Collider Detector at Fermilab (CDF). Employing techniques similar

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CDF and D0 Collaborations have spanned the Globe

CDF Collaboration

-  **Canada**
[McGill Univ.](#)
[Univ. of Toronto](#)
-  **USA**
[Argonne National Laboratory, IL](#)
[Brandeis Univ., MS](#)
[Univ. of Chicago, IL](#)
[Davis UC, CA](#)
[Duke Univ., NC](#)
[FNAL, IL](#)
[Univ. of Florida, FL](#)
[Harvard Univ., MA](#)
[Univ. of Illinois, IL](#)
[The Johns Hopkins Univ., MD](#)
[LBNL, CA](#)
[MIT, MA](#)
[Michigan State Univ., MI](#)
[Univ. of Michigan, MI](#)
[Univ. of New Mexico, NM](#)
[The Ohio State Univ., OH](#)
[Univ. of Pennsylvania, PA](#)
[Univ. of Pittsburgh, PA](#)
[Purdue Univ., IN](#)
[Univ. of Rochester, NY](#)
[Rockefeller Univ., NY](#)
[Rutgers Univ., NJ](#)
[Texas A&M Univ., TX](#)
[Texas Tech Univ., TX](#)
[Tufts Univ., MA](#)
[UCLA, CA](#)
[Univ. of Wisconsin, WI](#)
[Yale Univ., CT](#)
-  **Russia**
[JINR, Dubna](#)
[ITEP, Moscow](#)
-  **Germany**
[Univ. Karlsruhe](#)
-  **Switzerland**
[Univ. of Geneva](#)
-  **UK**
[Glasgow Univ.](#)
[Univ. of Liverpool](#)
[Univ. of Oxford](#)
[Univ. College London](#)
-  **Italy**
[Univ. of Bologna, INFN](#)
[Frascati, INFN](#)
[Univ. di Padova, INFN](#)
[Pisa, INFN](#)
[Univ. di Roma I, INFN](#)
[INFN-Trieste](#)
[Univ. di Udine](#)
-  **Spain**
[Univ. of Cantabria](#)
-  **Japan**
[Hiroshima Univ.](#)
[KEK](#)
[Osaka City Univ.](#)
[Univ. of Tsukuba](#)
[Waseda Univ., Tokyo](#)
-  **China**
[Academia Sinica, Taiwan](#)
-  **Korea**
[KHCL](#)



D0 Collaboration

PHYS. REV. D **103**, 012003 (2021)

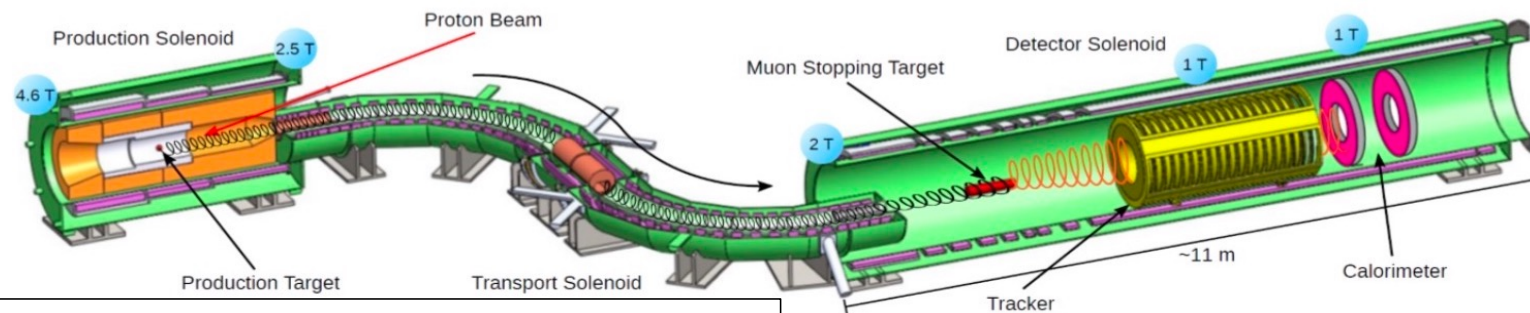
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-  ¹⁴LPNHE, Universités Paris VI and VII, CNRS/IN2P3, F-75005 Paris, France
-  ¹⁵IRFU, CEA, Université Paris-Saclay, F-91191 Gif-Sur-Yvette, France
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-  ¹⁹Physikalisches Institut, Universität Freiburg, 79085 Freiburg, Germany
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-  ²¹Institut für Physik, Universität Mainz, 55099 Mainz, Germany
-  ²²Ludwig-Maximilians-Universität München, 80539 München, Germany
-  ²³Panjab University, Chandigarh 160014, India
-  ²⁴Delhi University, Delhi-110 007, India
-  ²⁵Tata Institute of Fundamental Research - Mumbai-400 005, India
-  ²⁶University College Dublin, Dublin 4, Ireland
-  ²⁷Korea Detector Laboratory, Korea University, Seoul 02841, Korea
-  ²⁸CINVESTAV, Mexico City, 07360, Mexico
-  ²⁹Nikhef, Science Park, 1098 XG Amsterdam, Netherlands
-  ³⁰Radboud University Nijmegen, 6525 AJ Nijmegen, Netherlands
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-  ³²Institute for Theoretical and Experimental Physics, Moscow 117259, Russia
-  ³³Moscow State University, Moscow 119991, Russia
-  ³⁴Institute for High Energy Physics, Protvino, Moscow Region 142281, Russia
-  ³⁵Petersburg Nuclear Physics Institute, St. Petersburg 188300, Russia
-  ³⁶Catalana de Recerca i Estudis Avançats (ICREA) and Institut de Física d'Altes Energies (IFAE), 08193 Bellaterra (Barcelona), Spain
-  ³⁷Uppsala University, 751 05 Uppsala, Sweden
-  ³⁸Taras Shevchenko National University of Kyiv, Kiev 01601, Ukraine
-  ³⁹Lancaster University, Lancaster LA1 4YB, United Kingdom
-  ⁴⁰Imperial College London, London SW7 2AZ, United Kingdom
-  ⁴¹The University of Manchester, Manchester M13 9PL, United Kingdom
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-  ⁴³University of California Riverside, Riverside, California 92521, USA
- ⁴⁴Florida State University, Tallahassee, Florida 32306, USA

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Today and the future, Muon Campus

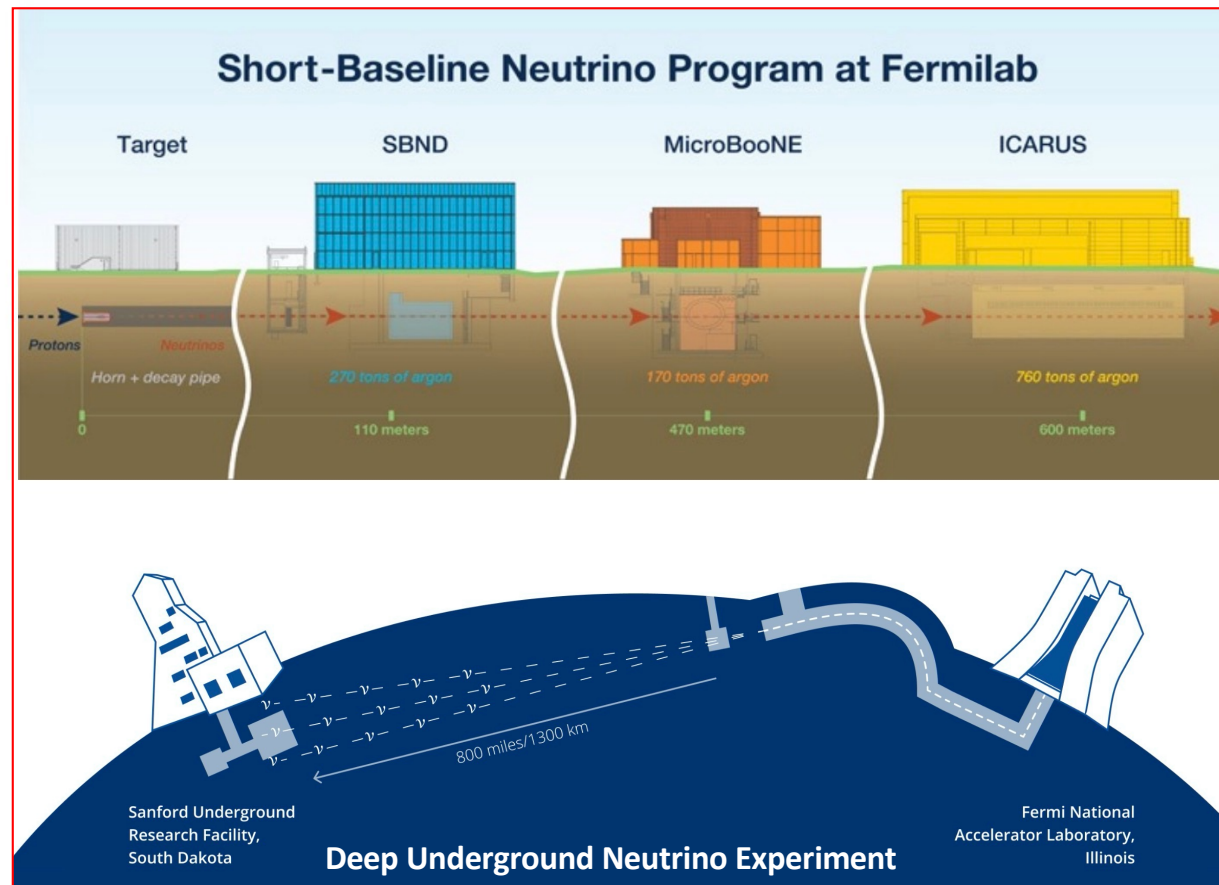


Muon-to-electron conversion Experiment (Mu2e) at Fermilab

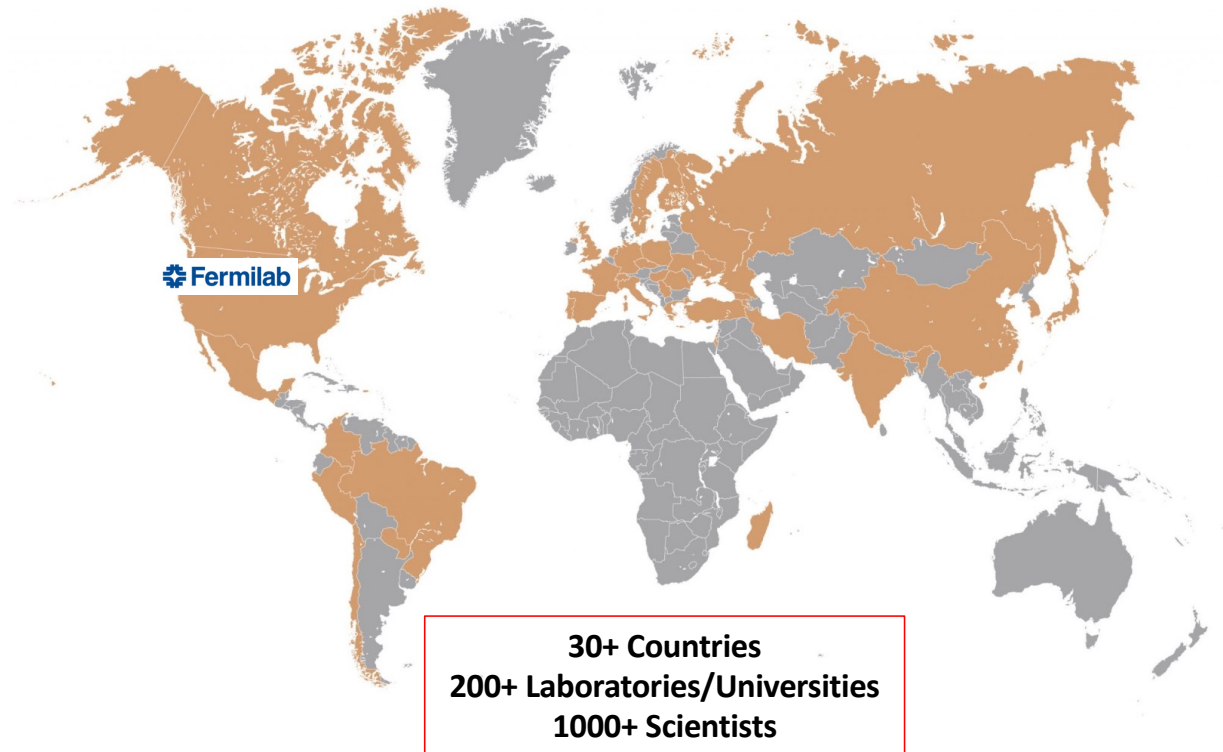


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Today and the future, Short-Baseline Neutrino Program (SBN) Deep Underground Neutrino Experiment (DUNE)



Fermilab Muon Campus, Short Baseline Neutrino Program and Deep Underground Neutrino Experiment



Czech Republic, Finland, France, Georgia, Germany, Greece, Hungary, Israel, Italy, Netherlands, Poland, Portugal, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom

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Proton-Improvement Plan II (PIP-II) Accelerator



- First accelerator to be built with significant international involvement
- Unique technology (SRF CW with protons) to generate world's most intense neutrino beam and power new discoveries

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INTENSE Academic and non Academic Partners

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Harvard University, United States, Roxanne Guenette (guenette@g.harvard.edu)

The University of Chicago, United States, David Schmitz (dwschmitz@uchicago.edu)

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Slac National Accelerator Laboratory, United States, Tracy Usher (usher@slac.stanford.edu)

Clever Operation, France, Radia Sia (r.sia@clever-operation.com)

Our collaborators at the Academic Partners in the US spend a lot of time at Fermilab. They will provide additional supervising capability to the Early Stage Researchers at Fermilab. Smart Engineering & Management (Greece), Clever (France) and the Institute of High Energy Physics (China) will provide Seminars and Lectures.

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