



## The Dark Wave Workshop - Fermilab

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# Fermilab at a Glance

- America's particle physics and accelerator laboratory
- Operates the largest US particle accelerator complex
- ~2,100 staff and ~\$750M/year budget
- 6,800 acres of federal land
- Facilities used by >4,000 scientists from >50 countries

As we move into the next 50 years, our vision remains to solve the mysteries of matter, energy, space, and time for the benefit of all.



# Fermilab as a User facility from its inception



Leon Lederman

- 8 -

AADD-6  
June 25, 1963

Part II

THE TRULY NATIONAL LABORATORY (TNL)

L. M. Lederman  
Nevis Laboratories, Columbia University

” The enthusiasm and cooperation of the entire high energy community can be assured when it is clear that the new facilities are accessible as a right to any physicist bearing a competitively acceptable proposal”

# FNAL is an international facility

Next Generation facilities must be international to succeed!

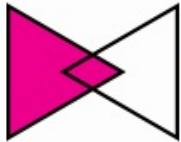
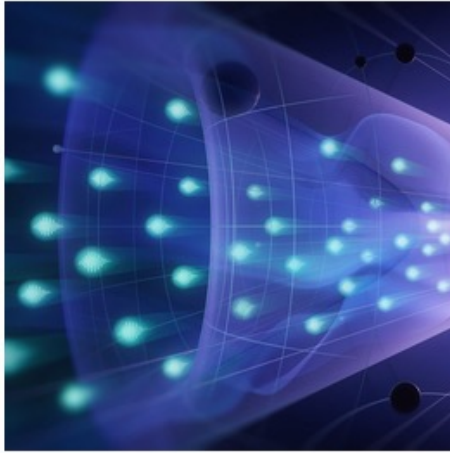


“Now more than ever, particle physics is an international, even global, endeavor”

*HEPAP P5 report, 2023*

“Continue support for and actively seek engagement with international collaborations and partnerships of all sizes”

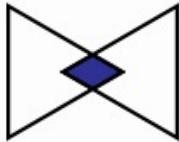
*DOE International Benchmarking Report, 2023*



Decipher  
the  
Quantum  
Realm

Elucidate the Mysteries  
of Neutrinos

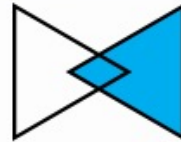
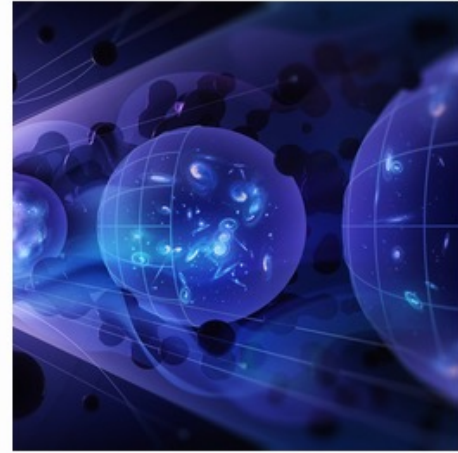
Reveal the Secrets of  
the Higgs Boson



Explore  
New  
Paradigms  
in Physics

Search for Direct Evidence  
of New Particles

Pursue Quantum Imprints  
of New Phenomena



Illuminate  
the  
Invisible  
Universe

Determine the Nature  
of Dark Matter

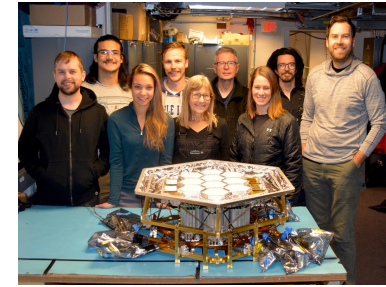
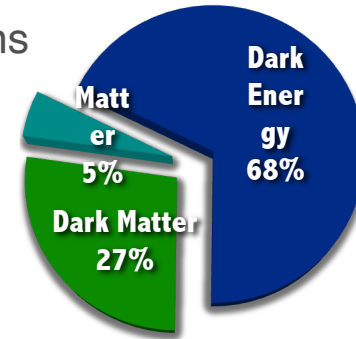
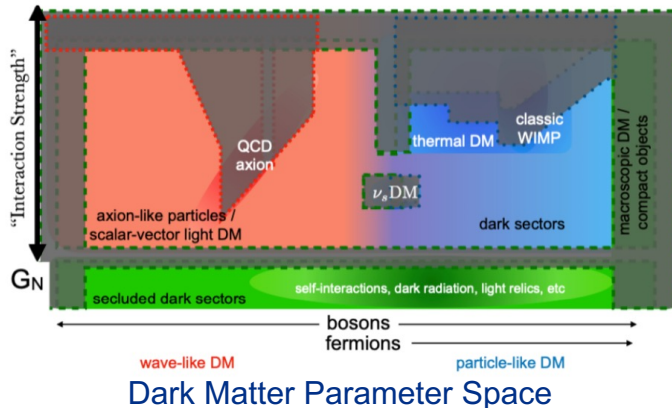
Understand What Drives  
Cosmic Evolution

[Link to full report](#)

# Cosmic Science

- The Cosmic Frontier addresses fundamental questions by connecting the very small to the very large:
  - **What is the dark matter?**
  - **What is dark energy?**
  - **What is the physics of inflation?**

*Aim high, search wide, delve deep*



SPT-3G Focal Plane at the South Pole

Fermilab roles capitalize on unique strengths, core infrastructure, detector development support, facilities, and large talent pool

- Technical capabilities built up from accelerator program are applicable to cosmic experiments, including the **largest HEP investment in detector development**
- **Large pool of engineers and technicians**, all available to the user community

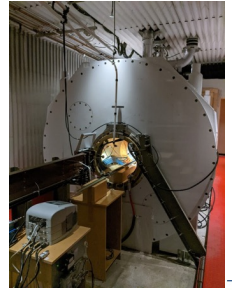
# Dark Wave Lab (Axion Center for Dark Matter)

- Build on facility for ADMX-EFR axion dark matter search
- User facility for pathfinder experiments: prototypes to first measurements

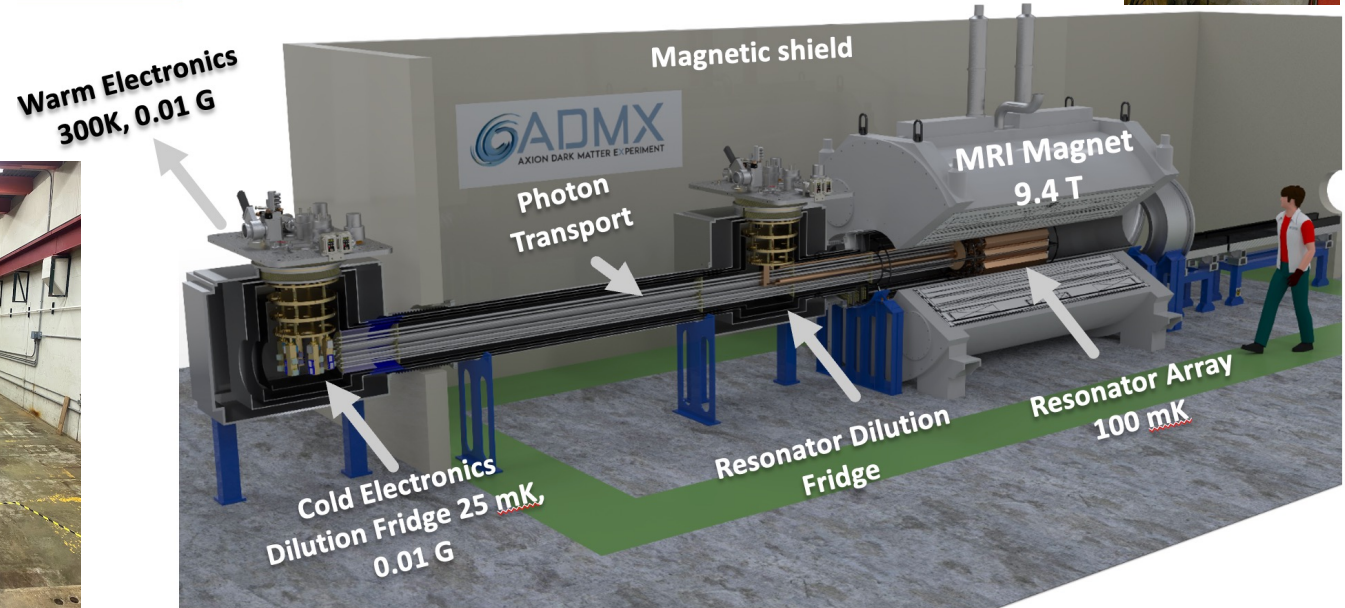
PW8/HIL at FNAL: Large, shallow underground hall with adjacent surface building. Total 13,000 square ft.

About half the space will be used by ADMX-EFR.

Expand for full Dark Wave Lab



## ADMX-EFR Experiment Layout



**Thank you!**



Wilson Hall and IERC at dawn. The sloped roof on IERC is intended to mimic the curve of Wilson Hall rotated 90 degrees; this is especially evident when the image of IERC is doubled in the reflecting pond. Photo credit: Brian Rubik