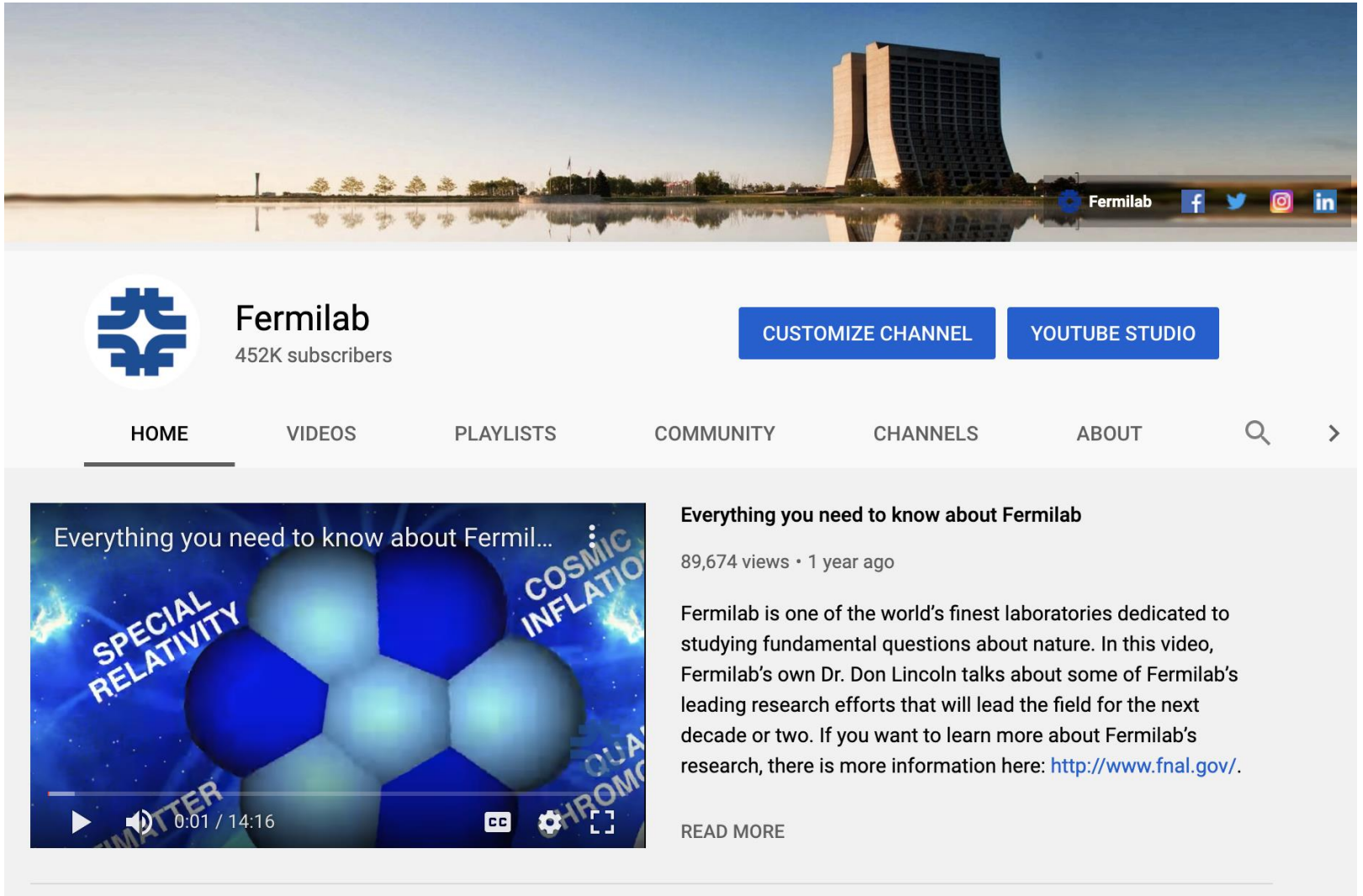
What's new in Fermilab news?

Lauren Biron
Fermilab Office of Communication
9/24/2020

First things first: bison

YouTube surpasses 450,000 subscribers



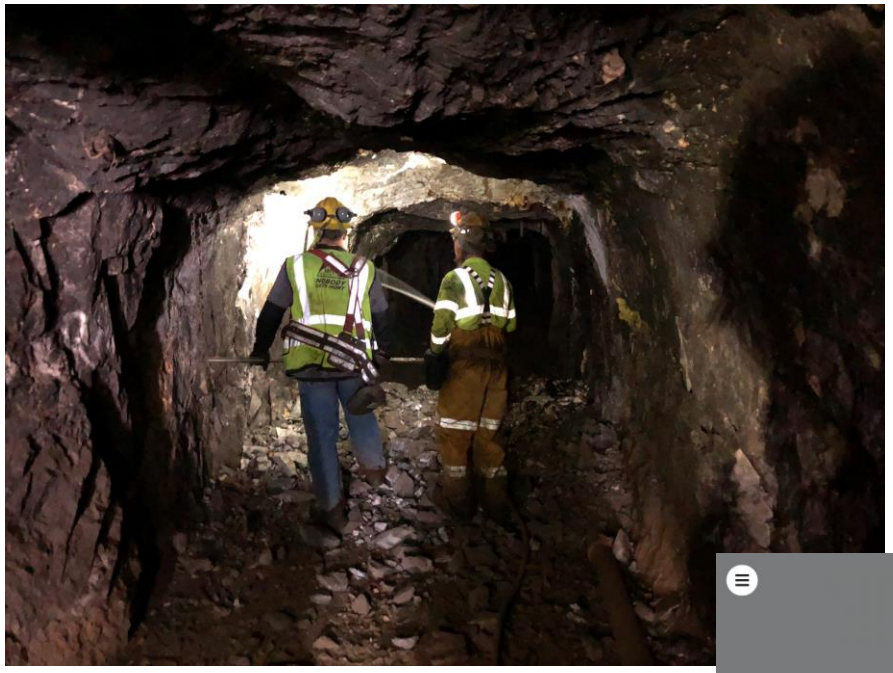
Fermilab awardees

Robert Ainsworth

Laura Fields

Jonathan Jarvis

Neutrinos? More like neutriyes.



Fermilab

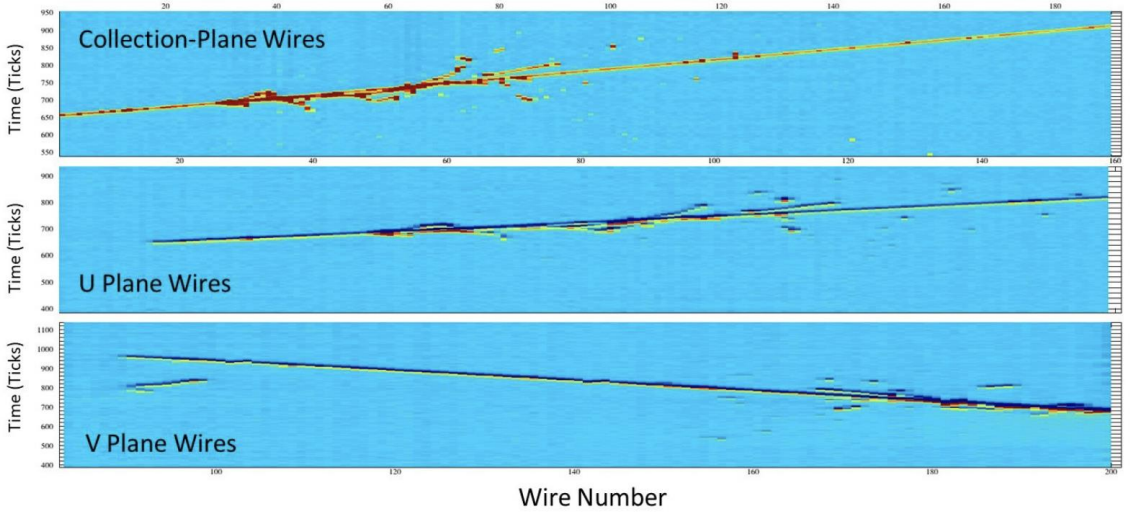
Looking ahead to DUNE with ICEBERG

In many ways, ICEBERG is a crystal ball for DUNE — lending insight on its future obstacles and requirements.

The cosmic-ray signatures allow physicists to test the DUNE electronics above ground with charge-tracking and photon-detection systems. Plus, because the cosmic rays are abundant on Earth's surface and easier to detect than neutrinos, the prototypes can be smaller and require much less precious argon.

The liquid argon used for ICEBERG would fill the bed of a pickup truck. DUNE, by comparison, requires enough argon to fill 12 Olympic-sized swimming pools. DUNE researchers are currently testing the second of several combinations of new and proven electronics with ICEBERG.

"The scientists, engineers and technical staff work together to find ways to continually improve the ICEBERG and keep all its support infrastructure running," said Kelly Hardin, a Fermilab technician who works on all liquid-argon detectors at Fermilab.



This event display shows three views of a cosmic muon interacting with liquid argon in the ICEBERG cryostat. Image: ICEBERG collaboration

Fermilab

Major construction milestones

Milestones


Fermilab
ENERGY
Office of Science
Cryogenic Plant Building Groundbreaking
for the PIP-II Particle Accelerator
July 22, 2020

Quantum of solace

U.S. Department of Energy unveils blueprint for the quantum internet at ‘Launch to the Future: Quantum Internet’ event

July 23, 2020

Share Tweet Email

Media contact

- Leah Hesla, Fermilab, media@fnal.gov, 630-840-3351

Editor’s note: The following press release was issued today by the U.S. Department of Energy. It announces the unveiling of a report that lays out the blueprint strategy for the development of a national quantum internet.

Fermilab planted the seeds for a future quantum internet on its Batavia, Illinois, site in 2017 with the installation of the Caltech-led Fermilab Quantum Network, or FQNET. FQNET is a system developed through a long-term partnership with AT&T, Caltech and Fermilab. In 2019, FQNET successfully demonstrated quantum teleportation at the lab. FQNET also acts as a test bed for state-of-the-art systems developed by Caltech. This year, Caltech achieved a record rate of high-fidelity quantum teleportation.

Using advanced quantum technology and joining with world-leading institutions in quantum information science, Fermilab and its partners are expanding the laboratory’s point-to-point network to a multinode system that will crisscross Chicagoland: the Illinois Express Quantum Network. IEQNET will connect Fermilab, Argonne National Laboratory and Northwestern University’s Evanston and Chicago campuses in a flexible quantum-network architecture. IEQNET leverages the research and technological advances of the FQNET program. This year, IEQNET demonstrated routing of entangled photons generated at FQNET between on-site nodes several kilometers apart.

Fermilab wins national quantum center

Superconducting Quantum Materials and Systems Center (SQMS)

Fermi National Accelerator Laboratory August 2020

The Superconducting Quantum Materials and Systems Center at Fermilab

SQMS brings together world-class experts from 20 institutions to take on one of the biggest challenges in quantum science: extending the lifetimes of quantum states. Advances here will lead to Fermilab and its partners building and operating a revolutionary quantum computer and developing quantum sensors to aid the search for undiscovered particles.

The Superconducting Quantum Materials and Systems Center, or SQMS, led by Fermilab, brings together national laboratories, academia and industry to make revolutionary advances in quantum computing and sensing, including the building and deployment of a beyond-the-state-of-the-art quantum computer. The quantum devices developed at SQMS will have game-changing impacts in basic science and in our everyday lives.

Longer information lifetimes

The driving mission of SQMS is to overcome the biggest barrier to the construction of a quantum computer: the short lifetime of the information that lives in a qubit. Qubits are devices that hold quantum information, analogs of the classical computer bit. Today's highest-performing qubits maintain information for milliseconds—not long enough for a viable quantum computer. SQMS researchers aim to design and fabricate qubits whose coherence times are thousands of times longer.

The specially designed qubits will leverage components called superconducting cavities, which were developed for particle accelerators. Fermilab-developed cavities have achieved coherence times of several seconds. By integrating cutting-edge, industry-designed and -fabricated computer chips into these cavities, SQMS collaborators expect to produce qubits with the longest coherence times ever demonstrated.

Instrumentally quantum

One of the ambitious goals of SQMS is to build and deploy a revolutionary quantum computer. Center researchers are also working to develop ultrasensitive quantum sensors, which aid physicists in searches for undiscovered particles and could lead to the discovery of the nature of dark matter.

A well-rounded partnership

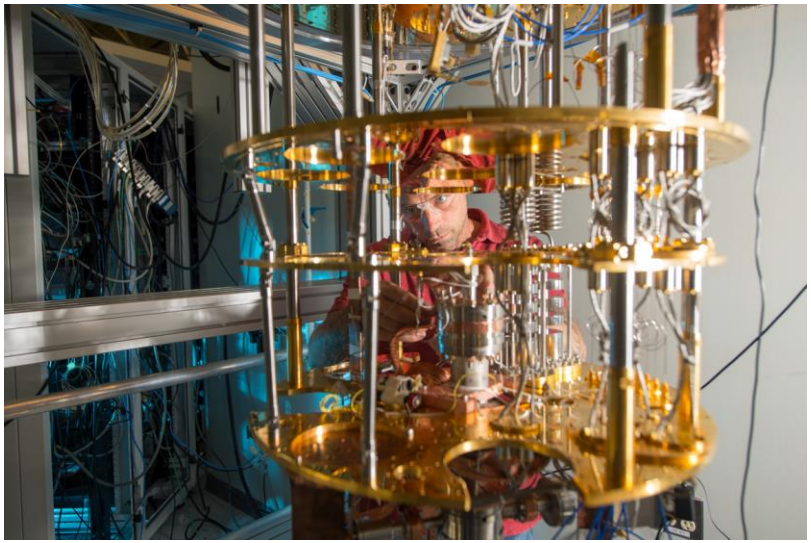
SQMS is a National Quantum Initiative Center, one of only five in the United States. A partnership of 20 institutions, it unites forefront achievements and world-class expertise in superconductivity, materials, computational and quantum science and technology. Fermilab is the host institution for SQMS, whose partners include Ames Laboratory, the Italian National Institute for Nuclear Physics, NASA Ames Research Center, the National Institute of Standards and Technology, Northwestern University and Rigetti Computing.

At the SQMS Center at Fermilab, scientists will leverage superconducting cavities to extend qubit coherence times. Photo: Fermilab

Quantum for all

Work at SQMS will have an impact far beyond quantum science and fundamental physics. Quantum innovation could transform fields such as biology, medicine and national security. By drawing on the research strengths of its partners, SQMS is advancing quantum science for the benefit of all.

A national laboratory funded by the Office of Science of the Department of Energy. www.fnal.gov Fermilab U.S. DEPARTMENT OF ENERGY



SQMS

UNDERWOOD CELEBRATES FERMILAB SELECTION TO LEAD DEPARTMENT OF ENERGY'S QUANTUM RESEARCH CENTER

August 27, 2020 | Press Release

WEST CHICAGO— Today, Congresswoman Lauren Underwood (IL-14) celebrated the Department of Energy's recent announcement selecting Fermilab to lead one of the Department's five new National Quantum Information Science Research Centers. The Department's announcement is a part of the U.S. National Quantum Initiative, investing over $1 billion in awards artificial intelligence and quantum information science research institutes. Fermilab will lead the Department's Superconducting Quantum Materials and Systems Center.

SCIENCE & NATURE

Argonne, Fermilab at Forefront of 'Transformational' Quantum Research

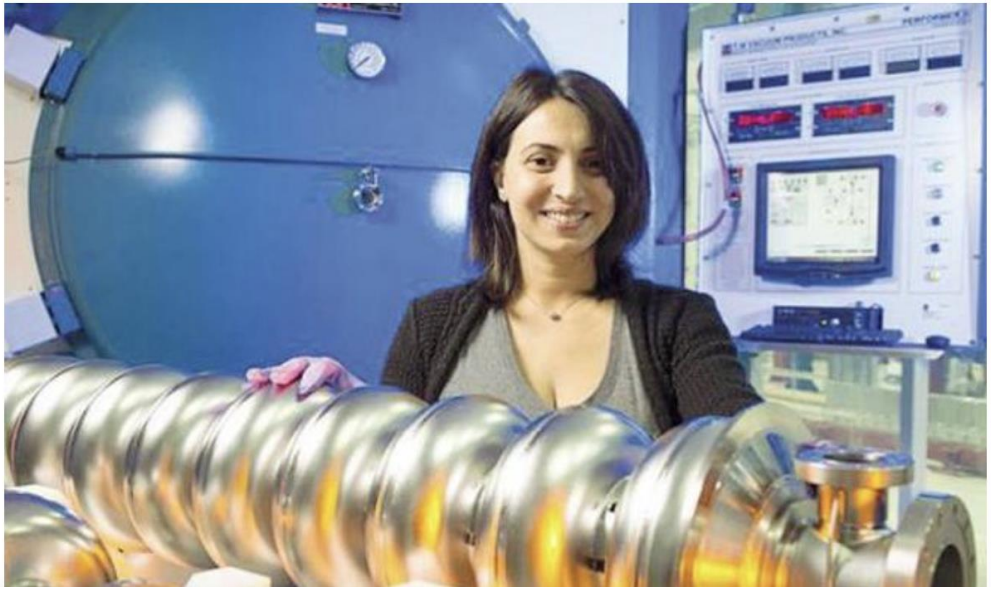
Paul Caine | September 1, 2020 6:25 pm

IL PERSONAGGIO

L'italiana che progetta il super computer quantico: «Il più potente di sempre»

Anna Grassellino, 39 anni, dirigerà il nuovo centro al Fermilab di Chicago per affrontare la National Quantum Initiative, il progetto per la creazione di un elaboratore avanzatissimo basato sui fotoni

di **Giovanni Caprara**



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