



Conéctate con Fermilab

Panel Session: Mechanical Engineering

Panel Chair: Roza Doubnik

Speakers: Hemanth Kiran Gutti, Adrian Orea, and Leandro Stefanazzi

October 13, 2022

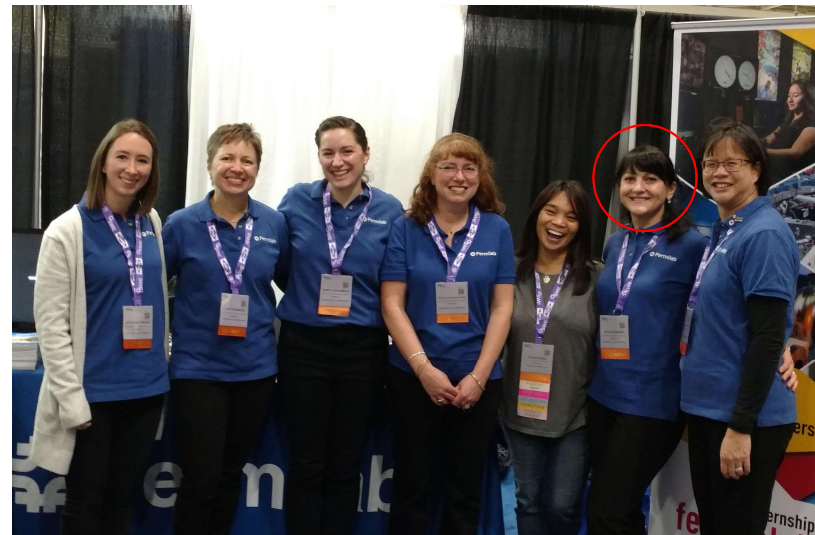
Roza Doubnik, Ph.D.

Fermilab
Neutrino Division
Technical Support Department
Cryogenics Group
Mechanical Senior Engineer
7 years at Fermilab

[linkedin.com/in/roza-doubnik-84067114](https://www.linkedin.com/in/roza-doubnik-84067114)



2022



SWE18 Conference, Minneapolis



The Journey

Worked at Yamburg beyond the Arctic Circle, Russia

Moved to USA in 2013

Was Born near Moscow, Russia



Who am I

A mechanical engineer with a total engineering experience of 17 years, cryogenic engineering experience at Fermilab 7 years.

- Lead cryogenic engineer in LArIAT operations (500 L of LAr);
- Involved in all stages of the design, construction, procurement, and operations of the ICARUS project (2x300 ton of LAr);
- A part of the design cryogenic team of SBND (~740 ton of LAr) (LBNF/DUNE prototype);
- Working on In-Kind contribution cryogenics for LBNF Project (4x17,450 tons LAr).

Previous work experience: 5 years in Israel Electric Corporation.

As part of the thermodynamic group, I designed, installed, tested, and commissioned three Combined Cycles for Power Plants.

Fermilab/INFN/CERN/DUNE Projects – additional information and links

ICARUS Neutrino Detector Installation at Fermilab

<https://youtu.be/1Qmr7WEKy-Q> 3.30 min



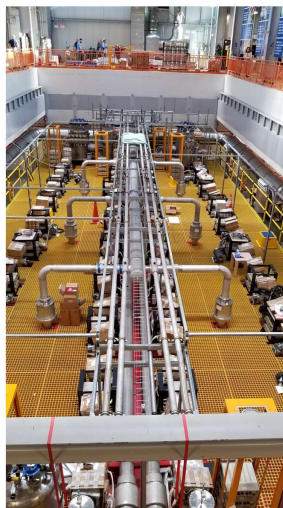
Design
Calculations
Installation
Fill
Operations
Documentation
Review

Prototyping (Short Baseline Program)

Brazil Group Visit 05.16.2022



SBN-FD (2 x 300 tonne LAr) – 2019



How do Fermilab engineers build big science? <https://youtu.be/486tO1fXk9g> 4.03 min

A mile underground: the large caverns and detectors of DUNE)

<https://youtu.be/zoxjRslzd4k> 1.55 min



The Science of the Deep Underground Neutrino Experiment (DUNE)

<https://youtu.be/nv13DswlKr8> 4.12 min



Hemanth Kiran Gutti

Fermilab
Particle Physics Division
Mechanical Engineering Department
High Precision Design Engineering
Mechanical Staff Engineer I
2 years at Fermilab

[linkedin.com/in/hemanthkirangutti](https://www.linkedin.com/in/hemanthkirangutti)



Education and Career progression

Master of Science in Mechanical Engineering

Northeastern University, Boston, USA

Bachelor of Technology in Mechanical Engineering

Manipal Institute of Technology, Manipal, India



**MANIPAL INSTITUTE
OF TECHNOLOGY**
MANIPAL
A Constituent Institution of Manipal University

E-Green LLC

Worked on developing and manufacturing new lighting systems for indoor and outdoor applications

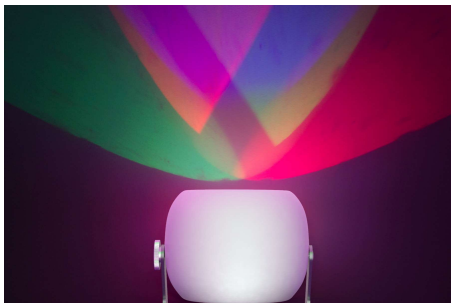


Photo courtesy: E-Green LLC

Metalmark innovations

Worked on developing an experimental setup for a new nano structured air filtration system



Photo courtesy: Metalmark innovations

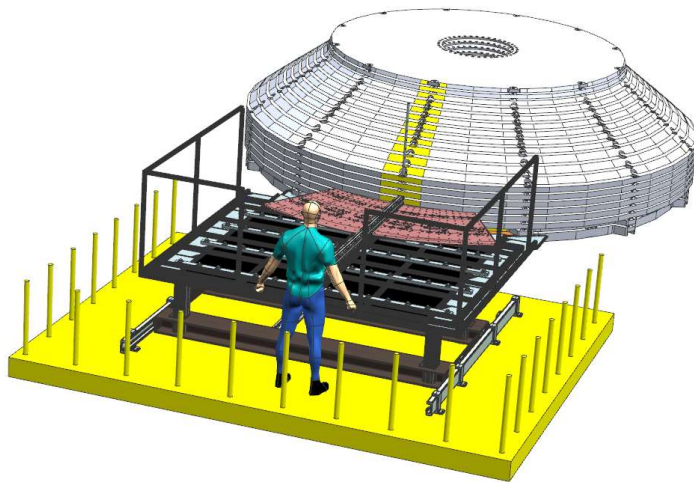
Massachusetts General Hospital(Tearney Lab)

Worked on the design and development of a novel photoacoustic transesophageal echocardiography(PA-TEE). Which included the design and manufacture of micro probe, the integration of mechanical, optical, and electrical systems

Work at Fermilab

Compact Muon Solenoid(CMS)- High Granularity calorimeter(HGCAL)

- Upgrading to present endcaps on existing larger hadron collider
- Working on the design of tooling required for installation at CERN



Installation setup for HGCAL cassettes

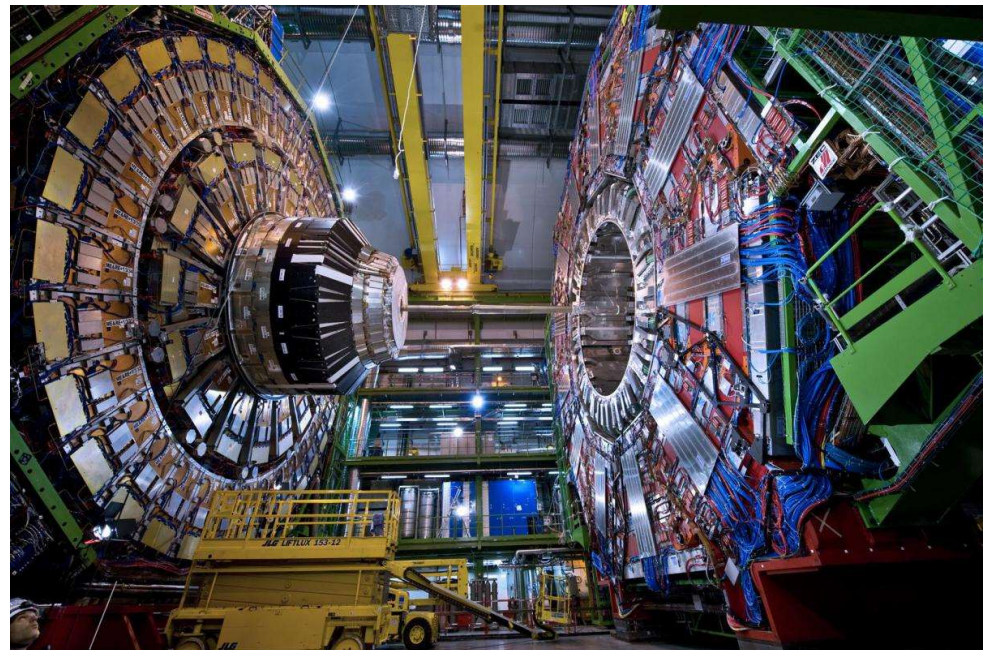
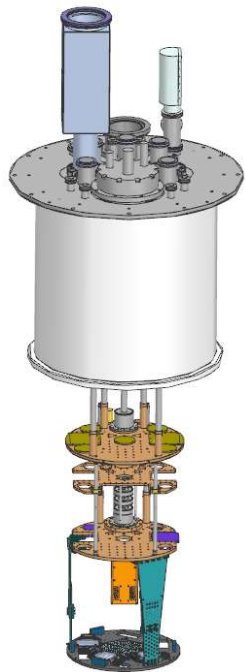


Photo courtesy: CERN

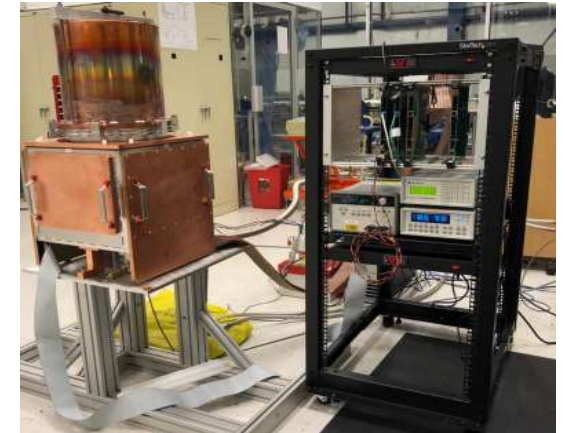
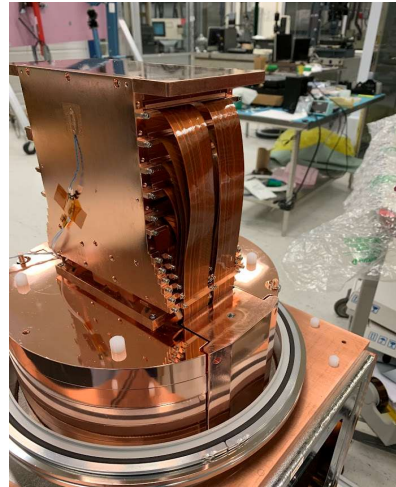
Work at Fermilab

Sub-Electron-Noise Skipper Experimental Instrument(SENSEI)

- Designing the vacuum vessel for cryogenic low background experiments for dark matter and Neutrinos using CCDs



Dilution refrigerator



Cosmic Microwave Background(CMB) experiment

- Designing the modules, fixtures, vacuum windows and tooling required for



Silicone wafers

Adrian Orea

Fermilab

Accelerator Division

Accelerator/Target Systems

Technical Support Department Engineering

Engineer II

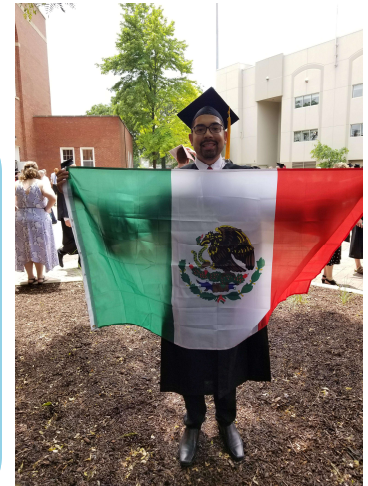
1 month at Fermilab

[linkedin.com/in/adrian-orea](https://www.linkedin.com/in/adrian-orea)



My Career

- Originally from Mexico (Came to the US when in 1999)
- Grew up in Crest Hill/Joliet, IL
- Graduated from North Central College (NCC)
 - 2014-2017
 - B.A. in Physics and minor in Math
- Graduated from the University of Illinois at Urbana Champaign (UIUC)
 - 2017-2019
 - B.S. Mechanical Engineering
- Technical Sales Engineer at GEA
 - 2019-2022 (September)
- Engineer II at Fermilab
 - 2022-Present



Current Role

- Overseeing the welding and fabrication of spare focusing horns
- Managing inventory for future horns
- Coordinating upgrade efforts
- Performing engineering calculations and simulations

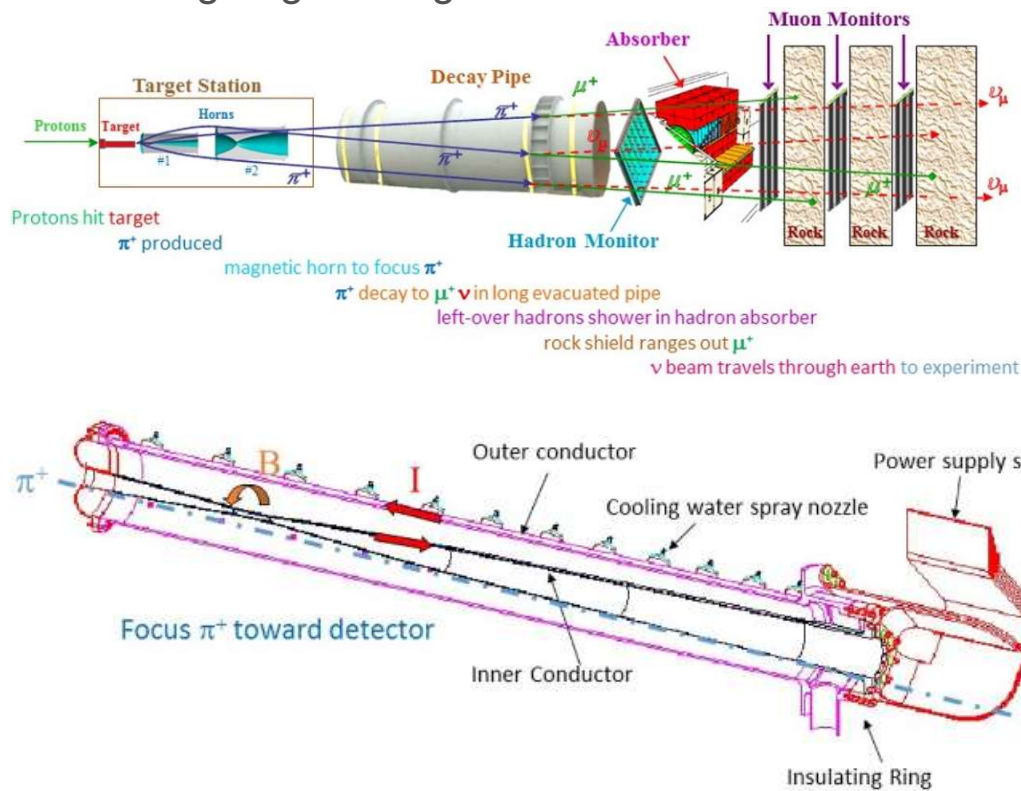


Figure credits to TSD sharepoint site

Leandro Stefanazzi

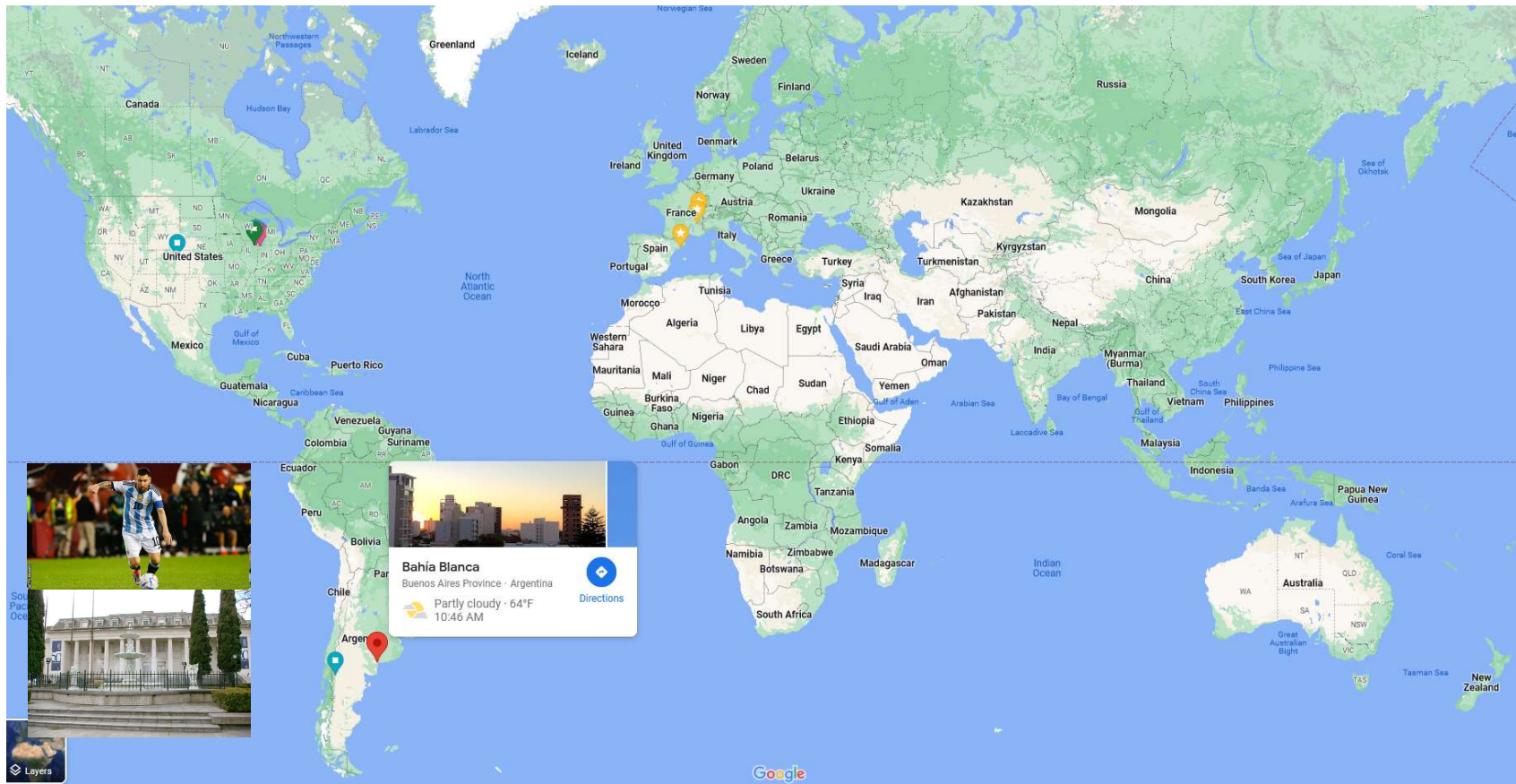
Fermilab
Scientific Computing Division
Accelerator/Target Systems
Frameworks, DAQ and Electronics
DAQ Controls and Detectors
Electronic Staff Engineer I
4 years at Fermilab

[linkedin.com/in/lstefanazzi](https://www.linkedin.com/in/lstefanazzi)

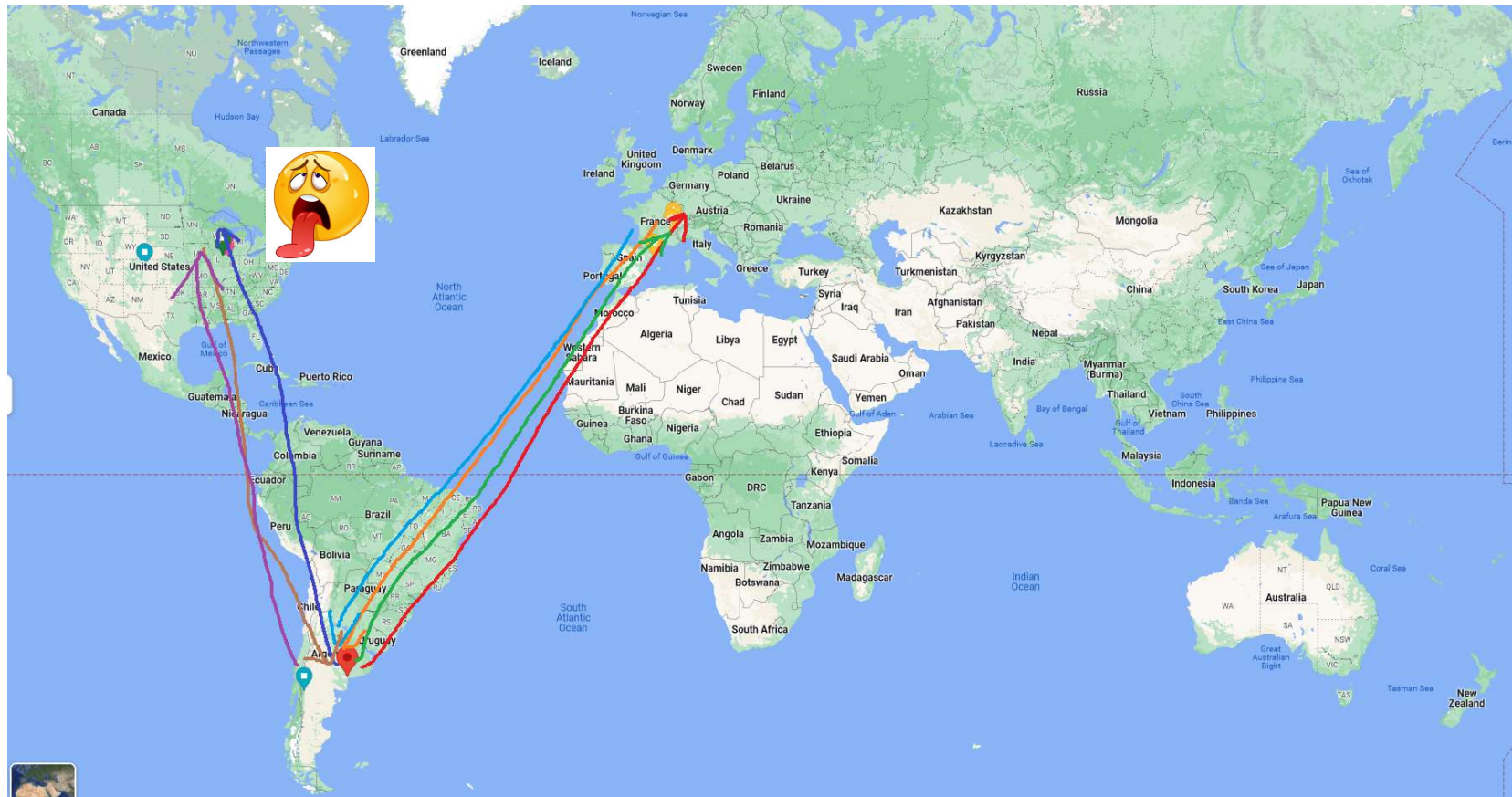


There and back again

Where it all started



Let's explore a bit



Allez les bleus

Home » News » Research » Device R&D Add to Bookmarks

By Richard Wilson 22nd July 2010

4G software defined radio configures in 50µs, says CEA-Leti

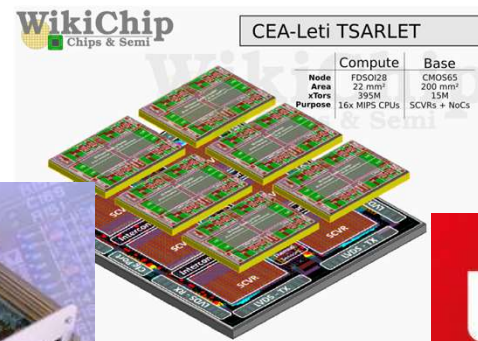
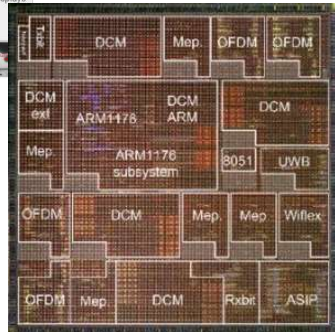
CEA-Leti has developed a digital baseband circuit for software-defined-radio and cognitive-radio applications.

RECOMMENDED ARTICLES

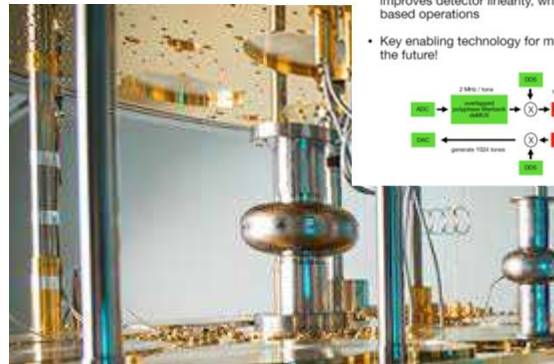
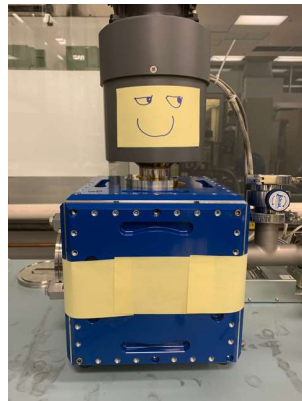
Leti targets 10-micron pixel displays at VR

The French microelectronics research organisation claimed it can be reconfigured in less than 50µs.

The chip, which has been dubbed Magali, is based on CEA-Leti's powerful mesh asynchronous network-on-chip (ANOC) infrastructure delivering 2.2Gbyte/s/link.



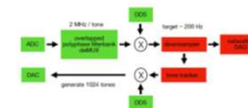
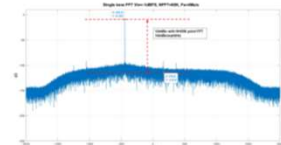
Fermilab is a lot of fun



Adam Anderson
13 July 2022
DPF21 Meeting

RFSoc Readout Platform


- Xilinx UltraScale+ RFSoc ZCU111 demo board (now old) has 8x ADCs (DACs) at 4 (6) GSPS
- MKID firmware developed at Fermilab (G. Canello, L. Stefanazzi, ++) demonstrated 1024x MUX over 2GHz bandwidth with adequate noise performance (path to 8k channels / board)
- Tone-tracking capability in development; drastically improves detector linearity, which is important for ground-based operations
- Key enabling technology for much larger MKID arrays in the future!




Fermilab is more fun

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Fermilab, UChicago Develop Low-cost, Fast Quantum Computer Control Kit


by John Russell

May 3, 2022


Model of quantum computers has always required fast, precise coordination between a traditional computer and the quantum computer. Mostly, these are custom systems and not cheap (or easy) to build. Recently researchers from Fermilab and the University of Chicago reported developing new control system – the Quantum Instrumentation Control Kit – that's both faster and lend less expensive than more commonly used control systems.

As described in an [article](#) on Fermilab website, "Currently, most control and readout systems for superconducting quantum computers use off-the-shelf commercial equipment not specialized to the task. As a result, researchers often must string together a dozen or more expensive components. The cost can quickly add up to tens of thousands of dollars per qubit, and the large size of these systems creates more problems."

The faster and more cost-efficient controls were developed by a team of Fermilab engineers led by senior principal engineer Gustavo Cancello whose goal was to create and test a field-programmable gate array-based (FPGA) controller for quantum computing experiments. David Schuster, a physicist at the University of Chicago, is the physicist's lab that helped with the specifications and verification on real hardware.



Fermilab engineers develop new control electronics for quantum computers that improve performance, cut costs



by Sandra Helset posted 02 May 2022

(News.Fermilab.gov) A new system of control and readout electronics, known as Quantum Instrumentation Control Kit, or QICK, developed by engineers at the U.S. Department of Energy's Fermi National Accelerator Laboratory, has proved to drastically improve quantum computer performance while cutting the cost of control equipment. IQT-News summarizes the news announcement of the QICK below.

"The development of the Quantum Instrumentation Control Kit is an excellent example of U.S. investment in joint quantum technology research with partnerships between industry, academia and government to accelerate a pre-competitive quantum research and development technologies."

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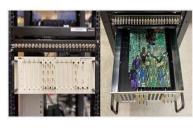
Fermilab Engineers Develop QICK for Quantum Computers

David Schuster, a physicist at the University of Chicago, led the university's lab that helped with the specifications and verification of real hardware.

Aishwarya Saseena May 3, 2022

1 minute read

The U.S. Department of Energy's Fermi National Accelerator Laboratory (Fermilab) engineers have developed a new system of control and readout electronics, known as Quantum Instrumentation Control Kit, or QICK, that can drastically improve quantum computer performance while cutting the cost of control equipment.



"The development of the Quantum Instrumentation Control Kit is an excellent example of U.S. investment in joint quantum technology research with partnerships between industry, academia and government to accelerate pre-competitive quantum research and development technologies," said Harriet Krum, DOE deputy director for science.

Fermilab engineers develop new control electronics for quantum computers that improve performance, cut costs

April 28, 2022


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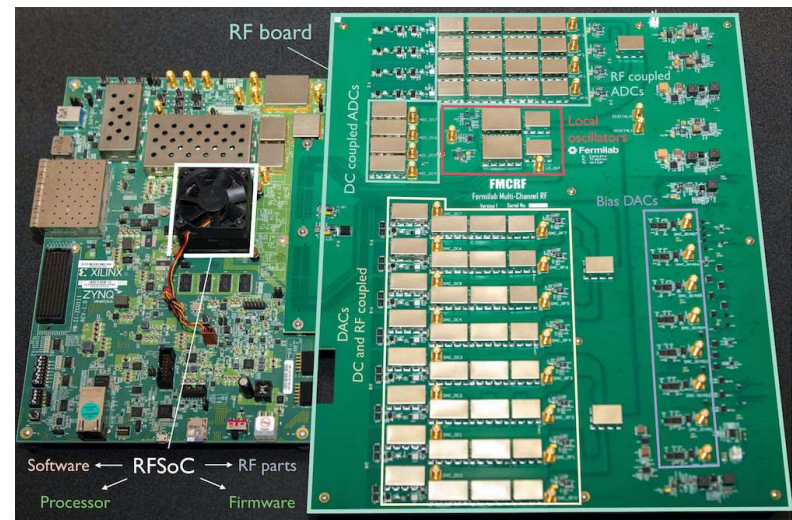
Media contact

• Tanya Mice: Fermilab_media@fnal.gov; 224-290-7983

When designing a next-generation quantum computer, a surprisingly large problem is bridging the communication gap between the classical and quantum worlds. Such computers need a specialized control and readout electronics to translate back and forth between the human operator and the quantum computer's languages – but existing systems are cumbersome and expensive.

However, a new system of control and readout electronics, known as Quantum Instrumentation Control Kit, or QICK, developed by engineers at the U.S. Department of Energy's Fermi National Accelerator Laboratory, has proved to drastically improve quantum computer performance while cutting the cost of control equipment.





Questions and Answers Session



Please share your experience via link

https://docs.google.com/forms/d/e/1FAIpQLSeK9ep-HMADicLcR-vP_eRws8A4XCSDSDVSUm14bIEQ645Wkw/viewform

Panel Discussion/Questions

- *What do you do in your job? Can you explain in one or two sentences? Briefly walk us through a typical day. Do you work alone? In a team?*
- *What has been the biggest challenge in your career? And how did you overcome the challenges?*
- *What is or has been the most rewarding?*
- *What made you choose the field you're in?*
- *What first got you interested in the field of science and technology?*
- *What recommendations do you have for students who are pursuing a career in STEM?*
- *Did you have a mentor throughout your academic and career? How has that helped you?*
- *Why is it important to get more people, interested in STEM?*