

# *Training for detector operations at Fermilab and CERN*

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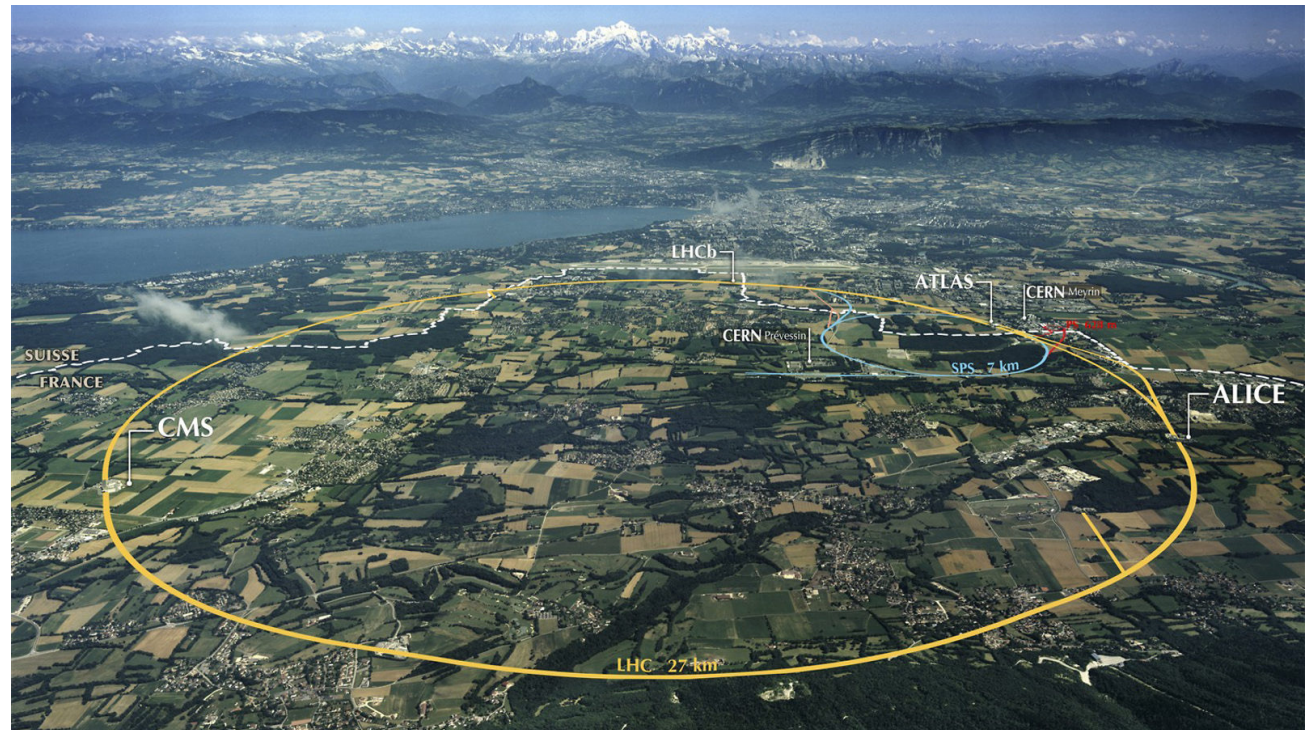
INTENSE MIDTERM REVIEW – PISA, 28/11/2022

## INTRODUCTION

- The current INTENSE program involves secondments at both CERN and Fermilab
- They are the two largest and most advanced particle physics laboratories in the world
- They share a similar mission and similar experimental technologies, with the consequent safety risks involved
- They are both committed to a constant scientific and technological training of both employees and visitors from other institutions
- There are some differences in the approach to training, which will be detailed in the next few slides

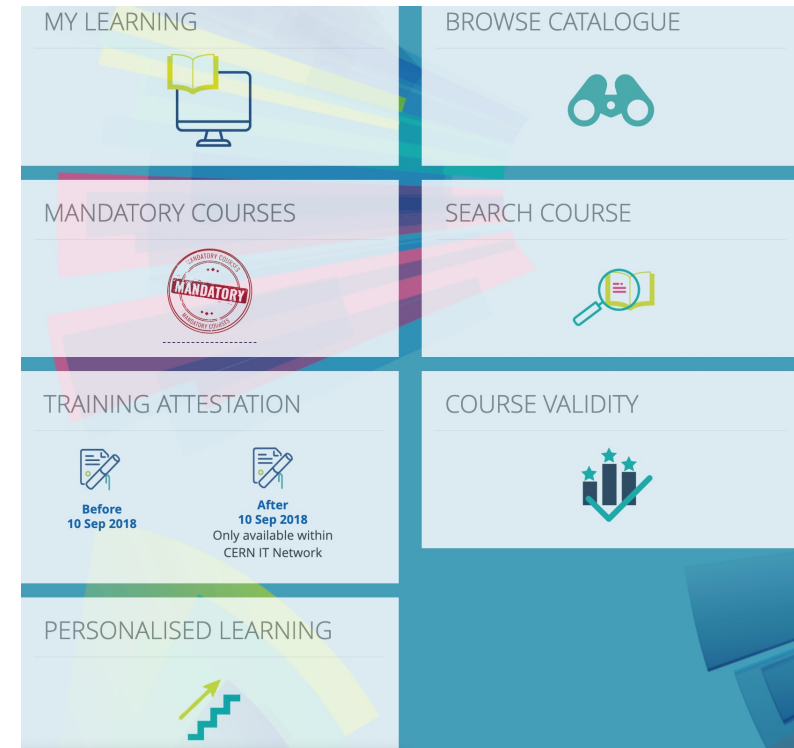
## CERN (EUROPEAN LABORATORY FOR PARTICLE PHYSICS)

- European laboratory managed collectively by 23 member states (+ 48 states with co-operation agreements)
- Founded in 1954
- Performs world-leading research in the fields of particle physics and accelerator science
- ~2500 staff members, and ~12000 scientific visitors



## GENERAL TRAINING FOR ACCESS TO CERN

- Any CERN user, even off-site, can in principle access CERN computing resources remotely. Basic computer security courses – with corresponding on-line exams (typically multiple-choice quizzes) – on computer security and data privacy are required
- On-site access is conditioned by additional security on-line courses, such as:
  - Safety at CERN
  - Covid-19
  - Electrical safety (awareness)
  - Cryogenic safety (awareness)
  - Radiation protection (awareness)
  - Road traffic
- All this training is managed automatically for each user



***CERN “My learning” page  
Summarizes each user’s  
training courses***

## SPECIFIC TRAINING FOR ACCESS TO CERN PROTECTED AREAS

- Some CERN areas, including many detector buildings, are declared as «protected» because of additional risk factors, such as higher radioactivity, high voltage or potential oxygen deficiency hazards (ODH)
- They therefore require further training, in addition to the generic CERN User one. This includes
  - Higher level training courses for electrical safety, radiation, cryogenics...
  - Access and emergency exits
  - Possible underground operations
  - ...

Safety training courses include both a theoretical part and a practical one, to be held in the dedicated Safety Training Centre on the Prevezin site

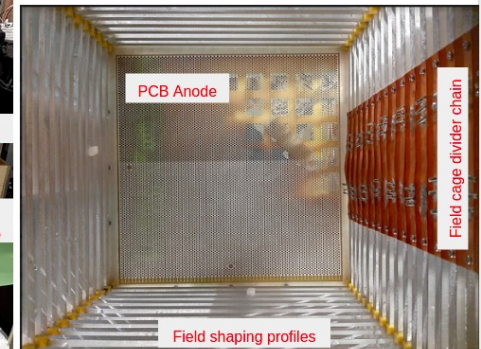
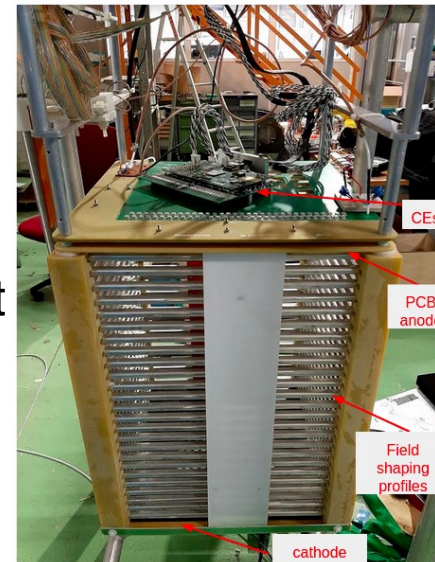
More information can be found at <https://hse.cern/services-support/safety-training>

- Of course anyone coming to CERN to perform specific measurements or learn experimental techniques can count on informal but dedicated training from local experts



## INTENSE ACTIVITIES AT CERN

- R&D activities for liquid Argon TPCs can be performed on two test facilities (~50 l and ~1000 l). Recent activities include:
  - Development/testing of PCB-based anodic read-out structures, of interest for the DUNE vertical drift module
  - Testing of light detection with PMT, SiPM, ARAPUCA detectors. In particular, wavelength shifting with Xenon doping
  - Low-energy calibration with radioactive sources (Bismuth-207)
- The ProtoDUNE detectors will test and validate the design for DUNE modules
- The second phase, currently in preparation, will consist in two detectors of similar mass (~400 t instrumented), both in CERN hadron beamlines:
  - *Horizontal drift*: classical wire-based LAr-TPC, with new ARAPUCA photon detectors and new calibration methods;
  - *Vertical drift*: new PCB-based read-out with vertical orientation. New solutions for HV (300 kV) distribution



## CERN ACADEMIC TRAINING

- CERN provides a program of academic training on science and technology subjects
- This is optional and has the goal to advance knowledge for all CERN users
- It is provided through series of lectures (~1 hour)
- Subjects can be very diverse: particle and accelerator physics, computer science, other science topics, social/ethical aspects of the CERN community (see <https://indico.cern.ch/category/72/> for details)
- A very thorough cycle of lectures (master degree level) are provided every summer in the context of the Summer Student program, but are open to everyone. Topics are particle physics, accelerator physics, data analysis techniques....
- Higher level training is provided through the Theory Workshops (<https://theory.cern/workshops-schools/all/2022>) and Theory Institutes (<https://theory.cern/th-institutes/all/2022>), that can include the participation of experimentalists

## FERMI NATIONAL ACCELERATOR LABORATORY (FERMILAB)

- The largest US laboratory in particle physics, managed by the US Department of Energy (Office of Science)
- Founded in 1967
- Performs world-leading research in the fields of particle physics, accelerator science and quantum computing
- 1750 employees, and scientific visitors from more than 50 countries





## GENERAL TRAINING FOR ACCESS TO FERMILAB

- Any person with a Fermilab account (including remote access to computing resources) is required to complete basic training courses
- They include computer security, interactions with the media, data sharing/publication policies, export control...
- All required training is managed by Environmental, Safety, Health and Quality (ESH&Q: [eshq.fnal.gov](http://eshq.fnal.gov))

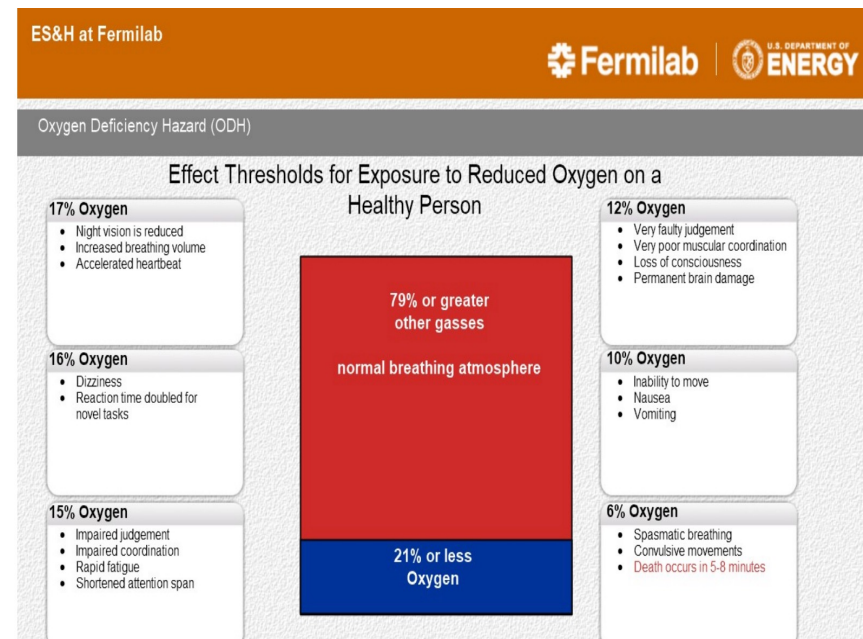
Course Code	Course Title	L
<a href="#">FN000519 / CB</a>	Counterintelligence Training	0
<a href="#">FN000374 / CB</a>	Basic Computer Security	1
<a href="#">FN000235 / CR</a>	Basic Electrical Safety	0
<a href="#">FN000387 / CR</a>	Electrical Safety Orientation	0
<a href="#">FN000377 / CR</a>	Environmental Management System (EMS)	0
<a href="#">FN000692 / CB</a>	Escort Responsibilities at Fermilab Sites	1
<a href="#">FN000540 / CB</a>	Export Control Awareness	1
<a href="#">FN000466 / CB</a>	General Records Management Training	0
<a href="#">FN000156 / CR</a>	Hazard Communication	0
<a href="#">FN000034 / CR</a>	New Employee ES&H Orientation	0
<a href="#">FN000029 / CR</a>	O.D.H. Training	0
<a href="#">FN000199 / CR</a>	PPE (Personal Protective Equipment) Availability And Use	0
<a href="#">FN000412 / CR</a>	Protecting Personal Information at Fermilab	0
<a href="#">FN000719 / CB</a>	Science and Technology (S&T) Risk Matrix Lab-wide Training	0
<a href="#">FN000693 / CB</a>	Site Access and Badging	1
<a href="#">FN000682 / CR</a>	Work Planning & Controls	1
<a href="#">FN000684 / CB</a>	Working Safely in the Era of COVID-19 and the Return to On-site Work	0
<a href="#">FN000508 / CR</a>	Workplace Violence and Active Shooter/Active Threat Awareness Training	0
<a href="#">FN000735 / CB</a>	GERT - (General Employee Radiation Training)	1
<a href="#">FN000655 / CB</a>	Interacting with the Media	0
<a href="#">FN000717 / CB</a>	New User/Affiliate Orientation	0
<a href="#">NDSBNFD1 / CB</a>	SBN Far Detector Building Hazard Awareness Training	1
<a href="#">FN000531 / CB</a>	Sexual Harassment Awareness and Prevention for Fermilab Users, Visitors and Contract	0

## TRAINING FOR FERMILAB ONSITE ACCESS

- Some additional courses are required for access to one of the FNAL sites: Batavia, Illinois (main site) or Lead, South Dakota (DUNE far detector site)
  - **ESH&Q new user/employee orientation** including basic safety rules and procedures:
    1. Environmental Management System (EMS) FN000377
    2. PPE (Personal Protective Equipment) Availability And Use FN000199
    3. Hazard Communication FN000156
    4. GHS Hazard Communication Update FN000496
    5. Electrical Safety Orientation FN000387
    6. Job Hazard Analysis FN000432
    7. General Employee Radiation Training FN000241
  - **Sexual harassment training and prevention**
  - **Workplace violence and active shooter/active threat awareness**
- Each employee or visitor has an Individual Training Plan (ITP) compiled by their supervisor, that lists the required training based on their job tasks. The TRAIN system manages each user's ITP (listing courses and their due date)
- Visitors without required training must be escorted on site at any time. They can have a limited access onsite (excluding controlled areas) for maximum 1 week

## BUILDING-SPECIFIC TRAINING AT FERMILAB

- In order to access to buildings or sites with additional risk factors (radiation, electrical, chemical...), specific training courses and exams must be passed
- Similarly, additional training may be required for performing specific tasks. This must be stated in the corresponding Work Plan
- As an example, lower levels of the ICARUS building (mezzanine and pit) have large quantities of cryogenic liquids -> high risk of oxygen deficiency (ODH)
- Access to these level requires ODH training, medical examination and an oxygen monitor. At least 2 people must access together



## FERMILAB ACADEMIC TRAINING

- Academic (non-compulsory) training at FNAL is provided through a rich program of seminar cycles on all research topics at the lab:
  - Accelerator Physics and technology
  - Computing Techniques
  - LHC Physics
  - Neutrino Physics
  - Particle Astrophysics
  - Research Techniques
  - Theoretical Physics
- Lectures targeted to undergraduate/graduate level (e.g. Neutrino University: <https://npc.fnal.gov/neutrino-university/> ) happen in summer in coincidence with the FNAL/INFN Summer Student program
- FSPA (student/postdoc association) has a cycle of dedicated lectures for orientation of early-career scientists in science and society
- Public colloquia (open to everyone) explore a wide range of science-related topics

[events.fnal.gov](https://events.fnal.gov)