

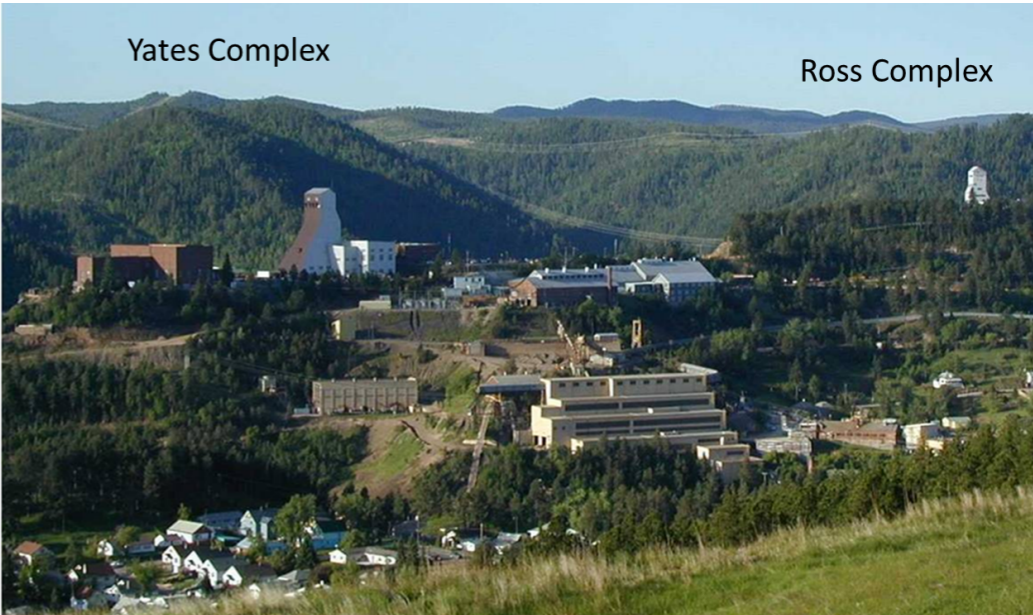
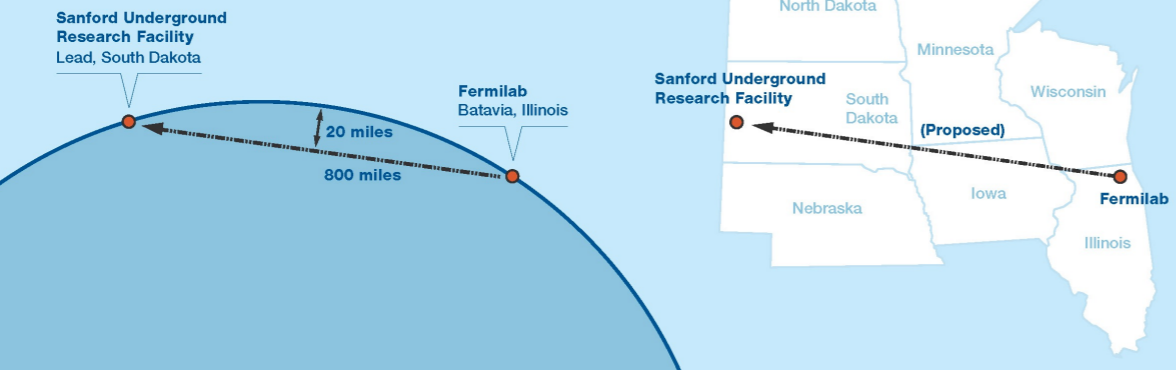
CERN's Neutrino Platform

Frank Filthaut

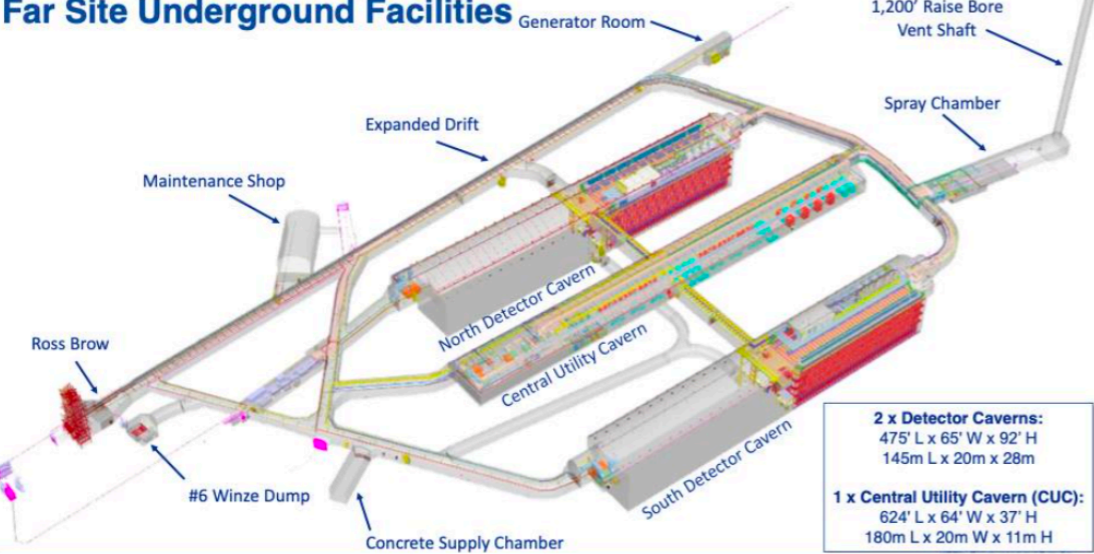
October 15, 2024

The Deep Underground Neutrino Experiment

Deep Underground Neutrino Experiment



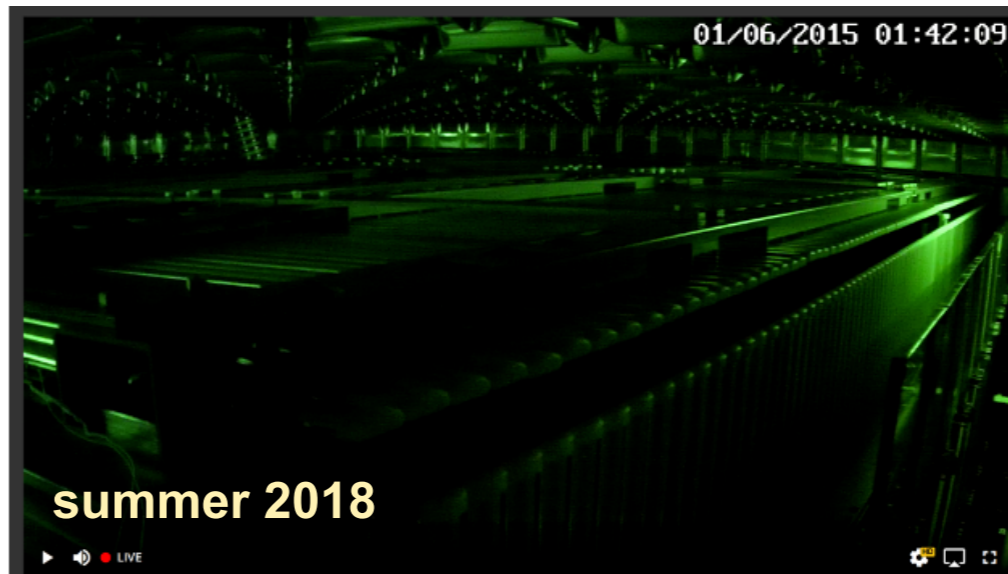
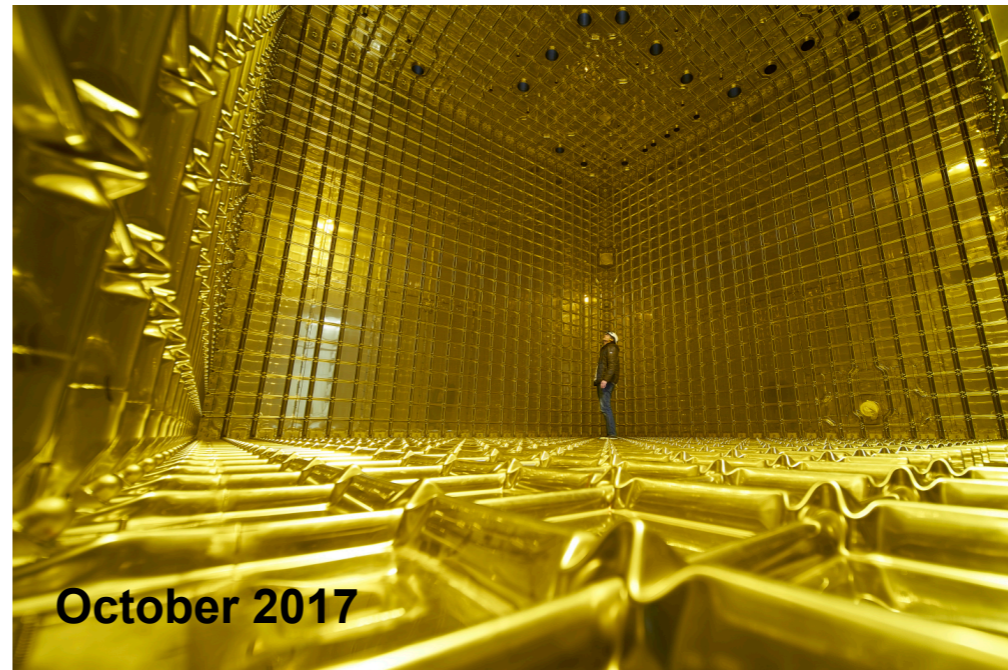
Far Site Underground Facilities



The Neutrino Platform @CERN

Conceived to prototype envisaged Far Detector technologies “at full scale” — 2 10x10x10 m³ cryostats in charged-particle beams

- in addition to CERN providing two FD cryostats to DUNE



Neutrino Platform: past & present

Use of NP in 2018—2019 has yielded invaluable information about FD detector technologies

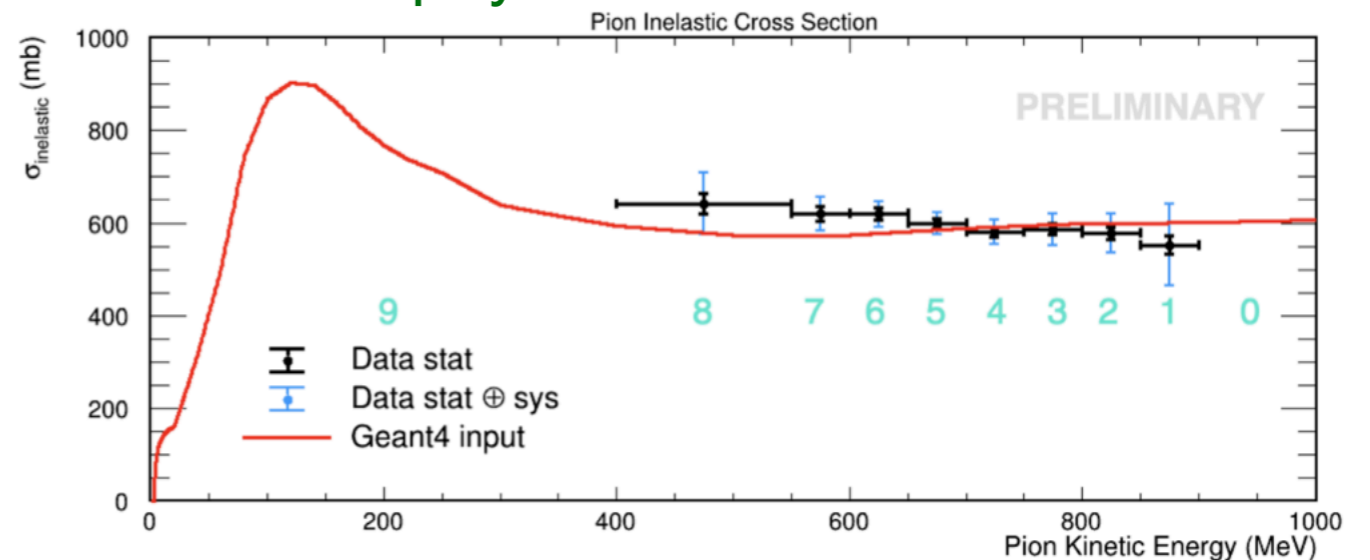
- abandoned the idea of a 2-phase system (à la XENONnT) as the liquid-gas interface could not be kept sufficiently stable $\Rightarrow \vec{E}$ -field instabilities
- but learned that electron lifetime in liquid argon can be made sufficiently high (purification) to avoid the need for gas amplification

This year, the updated Horizontal Drift prototype was again operated successfully

Focus for next year is on operation of the Vertical Drift prototype

- larger modifications compared to initial two-phase design

Some physics done with ProtoDUNE



Neutrino Platform: future

DUNE funding is staged:

- Phase 1: FD1, FD2 + initial Near Detector system — funded
- Phase 2: FD3, FD4 + ultimate ND system
 - needed for ultimate oscillation analysis sensitivity but not yet funded

FD3, FD4 are presently still in an R&D phase

- FD3: Vertical Drift à la FD2, but 4π photodetection coverage
 - notably, SiPM at high voltages, requiring power over fibre etc.
- FD4 (“module of opportunity”): wide range of possibilities, including different targets (water, water-based liquid scintillator, liquid scintillator + Cherenkov radiation, ...)

In the coming 10 years, the Neutrino Platform will continue to be much needed for prototyping of FD3, FD4 technologies

Other use of CERN's North Area

The NP's programme beyond the FD3, FD4 prototyping is not yet defined

The NP is actively inviting CERN's user community to propose experiments that could be hosted by it

- mixed p , K^\pm , π^\pm , e^\pm , μ^\pm beams
- $E < 7$ GeV (H4), $E < 12$ GeV (H2)



The SHiP experiment (Search for Hidden Particles) will be located at a new ECN3 extension close to the NP, starting from ~ 2030

- but SHiP's goal (long-lived particles) could be searched for using NP infrastructure as well!
- discussions on opportunities with Physics Beyond Colliders community to be held in the coming months