
UPDATES FOR THE FORWARD PHYSICS FACILITY

BNL Discussion

Jonathan Feng, UC Irvine

16 September 2021



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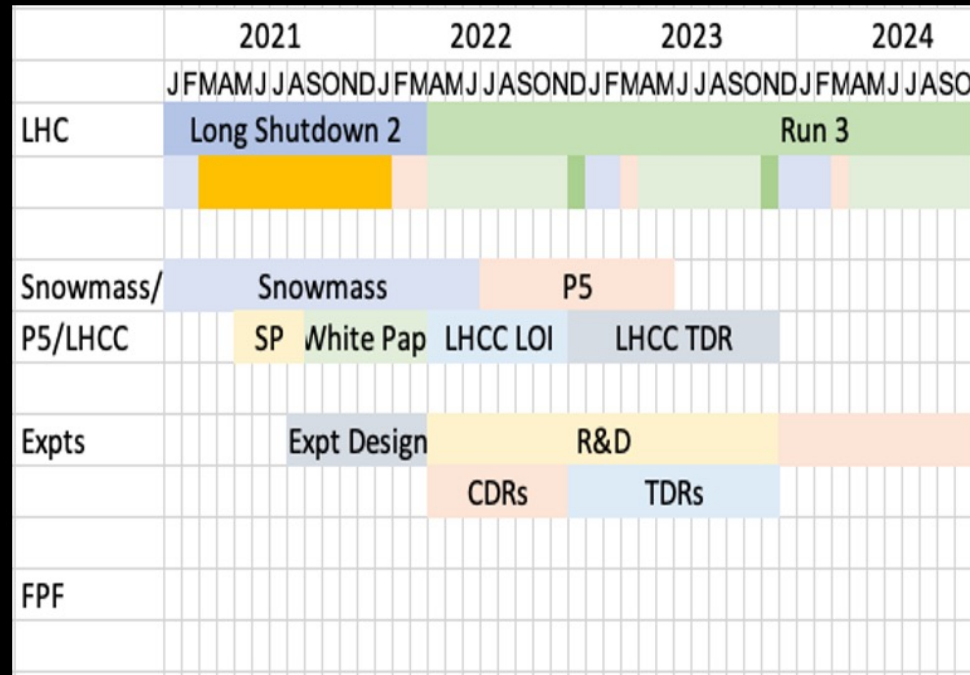


SLIDE FROM JULY DISCUSSION

EXAMPLE SCHEDULE

- Not even “very preliminary” !
- Assumes new cavern option for the FPF.

Shutdown / YETS
Proton physics
Ion physics
Commissioning with beam
Hardware commissioning / magnet training



- Starting when the HL-LHC starts is necessary to maximize physics. A long way to go, but experiment design in coming year is a crucial step.
- Would welcome lab help for designing FLArE, DOE reviews, etc.

FPF “SHORT PAPER”

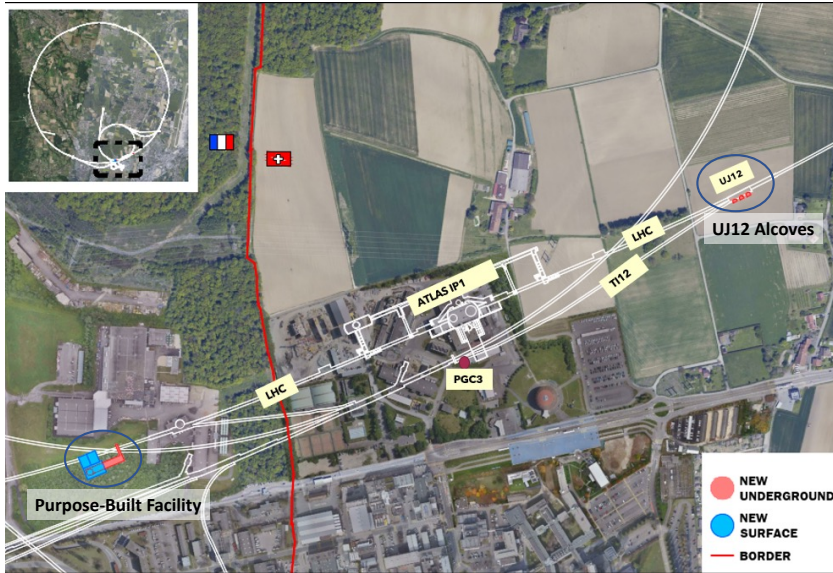
- 75 pages, but not “everything but the kitchen sink”; intended to be a distillation of key progress on the FPF so far.
- Written over the last ~2 months by ~80 co-authors, overall conveners: me, Felix, Maria.
- Will be submitted to arxiv next week, then to a journal. Current draft available on this meeting’s indico page.

The Forward Physics Facility: Sites, Experiments, and Physics Potential

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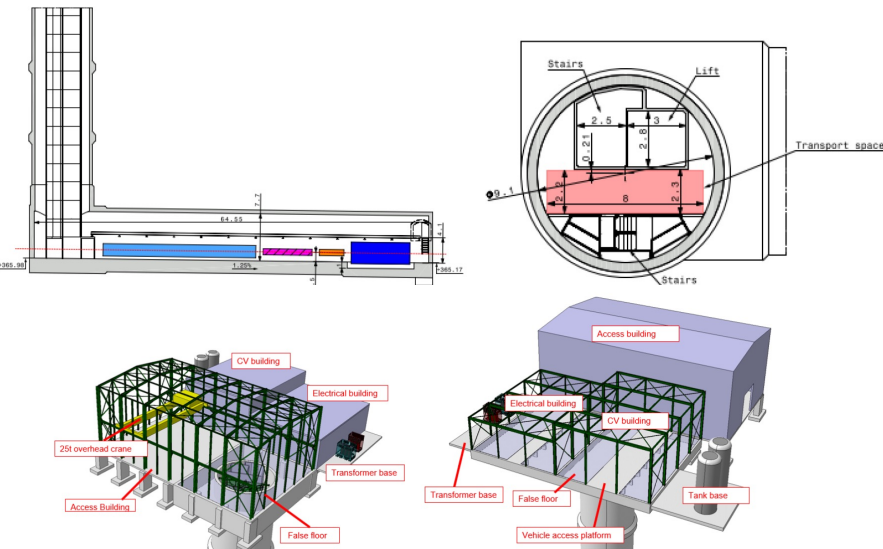
The Forward Physics Facility (FPF) is a proposal to create a cavern with the space and infrastructure to support a suite of far-forward experiments at the Large Hadron Collider during the High Luminosity era. Located along the beam collision axis and shielded from the interaction point by at least 100 m of concrete and rock, the FPF will house experiments that will detect particles outside the acceptance of the existing large LHC experiments and will observe rare and exotic processes in an extremely low-background environment. In this work, we summarize the current status of plans for the FPF, including recent progress in civil engineering in identifying promising sites for the FPF; the FPF experiments currently envisioned to realize the FPF’s physics potential; and the many Standard Model and new physics topics that will be advanced by the FPF, including searches for long-lived particles, probes of dark matter and dark sectors, high-statistics studies of TeV neutrinos of all three flavors, aspects of perturbative and non-perturbative QCD, and high-energy astroparticle physics.

FPF SHORT PAPER: FACILITY



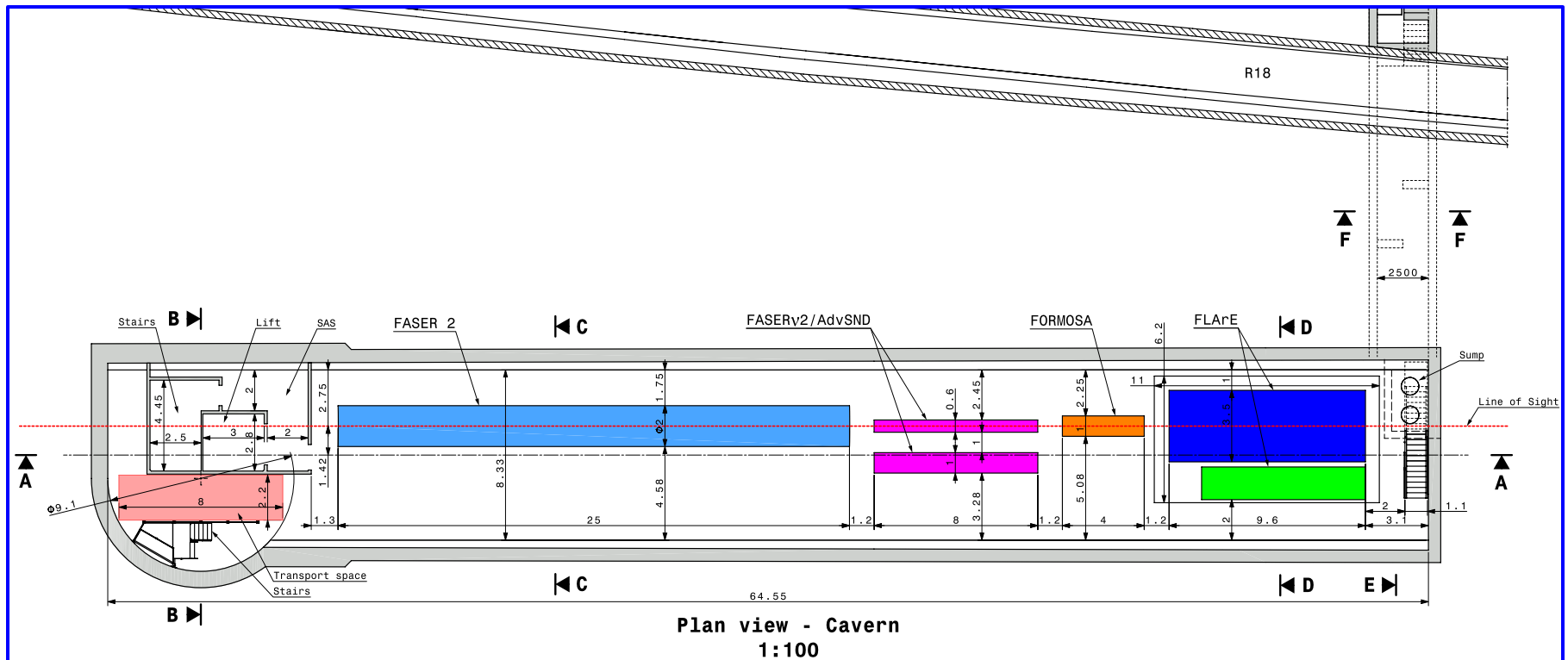
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FPF SHORT PAPER: EXPERIMENTS

- FASER2: tracker, magnetic spectrometer, LLP search
- FASERv2: ~20 tonne emulsion/tungsten detector, neutrinos, especially tau
- AdvSND: 2 ~2-10 tonne detector (AdvSND1 in FPF, AdvSND2 at $\eta \sim 4.5$), neutrinos
- FORMOSA: scintillator detector, millicharged particles, neutrino EDMs, etc.
- FLArE: ~10 tonne LArTPC, electron and muon neutrinos, DM scattering



FPF SHORT PAPER: PHYSICS

- Searches for New Physics
- Neutrino Physics
- QCD
- Astroparticle Physics

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OTHER UPDATES

- Snowmass is underway again. Upcoming FPF milestones:
 - FPF Short Paper will be on arxiv next week.
 - FPF Snowmass White Paper (~200-300 pages) will be completed by March 2022.
 - 3rd FPF Workshop (FPF3) will be 25-26 October 2021. Contributions welcome, <https://indico.cern.ch/event/1076733>.
- LHC Run 3 schedule being refined
 - 1st physics run now expected ~June 2022.
 - Run 3, currently 2022-24, may be extended through 2025, which would delay HL-LHC start to 2028. Will be discussed November 2021.
- First US federal funding for FASER/FASER_v awarded: \$1.5M NSF grant for 2021-24, support from Physics Division director funds.
- Good discussions with Milind, David, Gabriella, looking forward to approaching private foundations and DOE.