

# Forward Physics Facility PPC 2021

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Snowmass LOI:

<https://zenodo.org/record/4059893>

Kickoff Meeting:

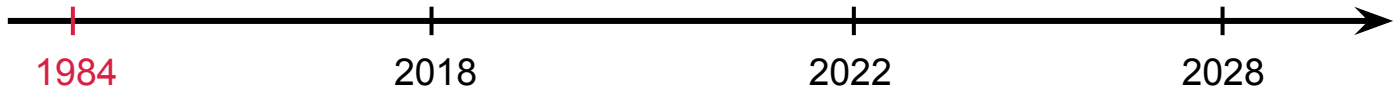
<https://indico.cern.ch/event/955956/>

Next Workshop (May 27th/28th):

<https://indico.cern.ch/event/1022352>

Felix Kling

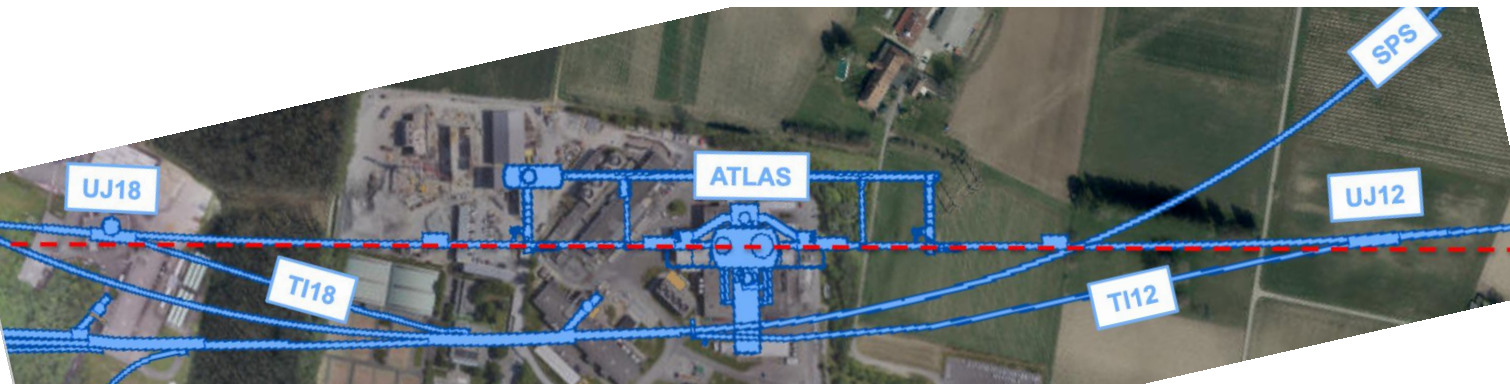


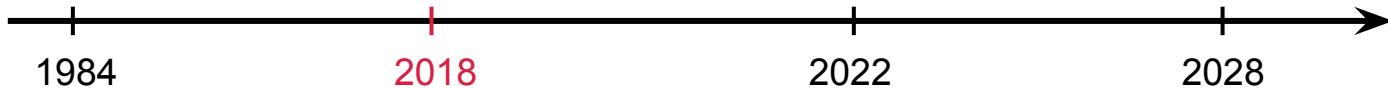


Neutrinos detected from many sources, but not from colliders.

But there is a huge flux of neutrinos in the forward direction, mainly from  $\pi$ , K and D meson decay. De Rujula et al. (1984)

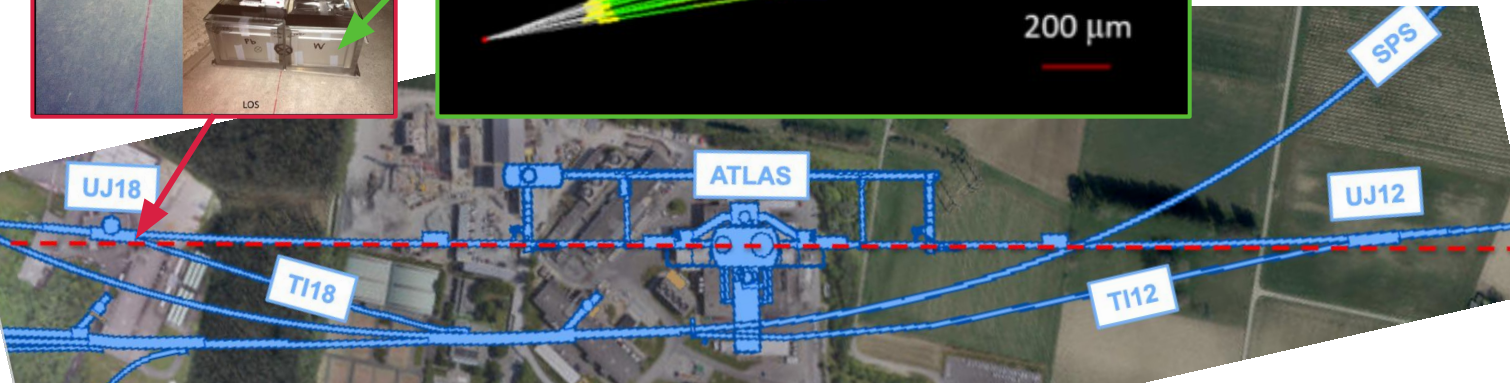
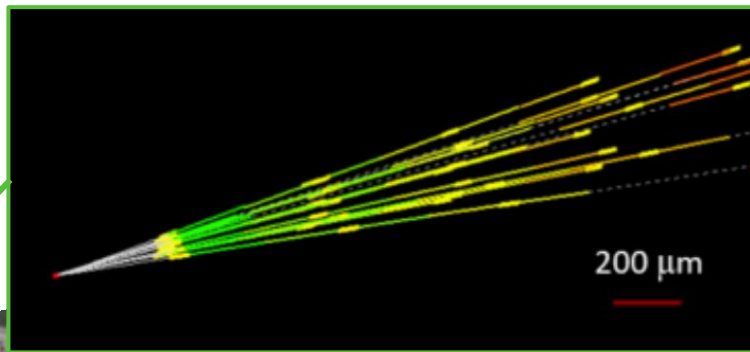
ATLAS provides an **intense** and **strongly collimated** beam of **TeV-energy** neutrinos along **beam collision axis**.





In 2018, the FASER collaboration placed ~30 kg **pilot emulsion detectors** in T118 for a few weeks. Expect ~10 neutrino interactions

First neutrino interaction candidates at the LHC were recently reported.



1984

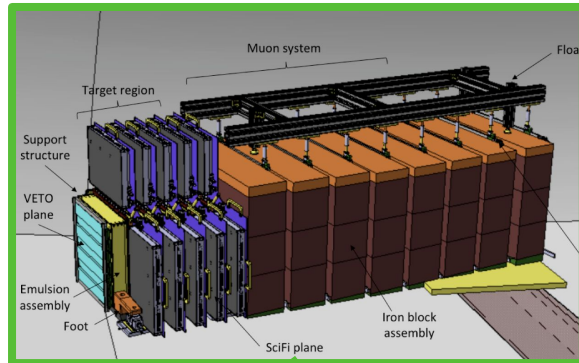
2018

2022

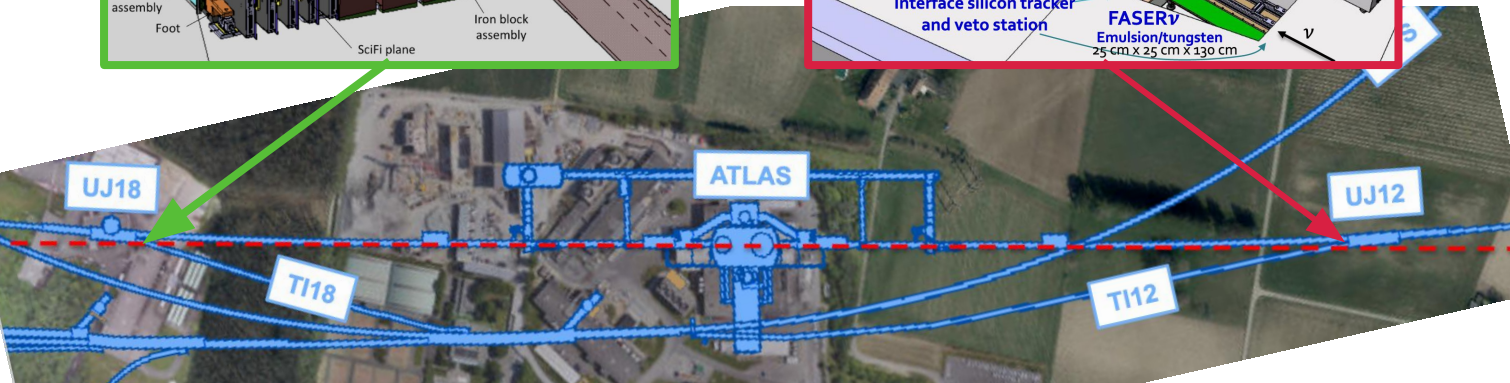
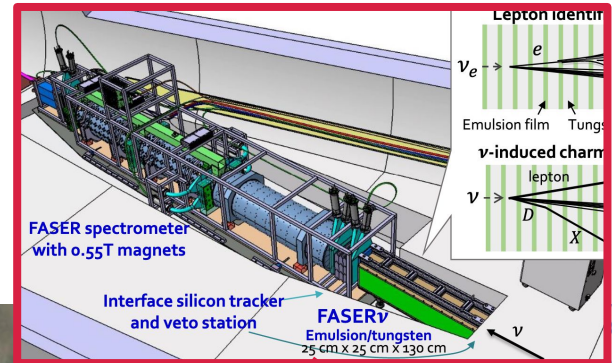
2028

During Run 3 of the LHC, two new experiments will detect about electron 1000 neutrinos, 10000 muon neutrinos and 10 tau neutrino

### SND@LHC



### FASERnu

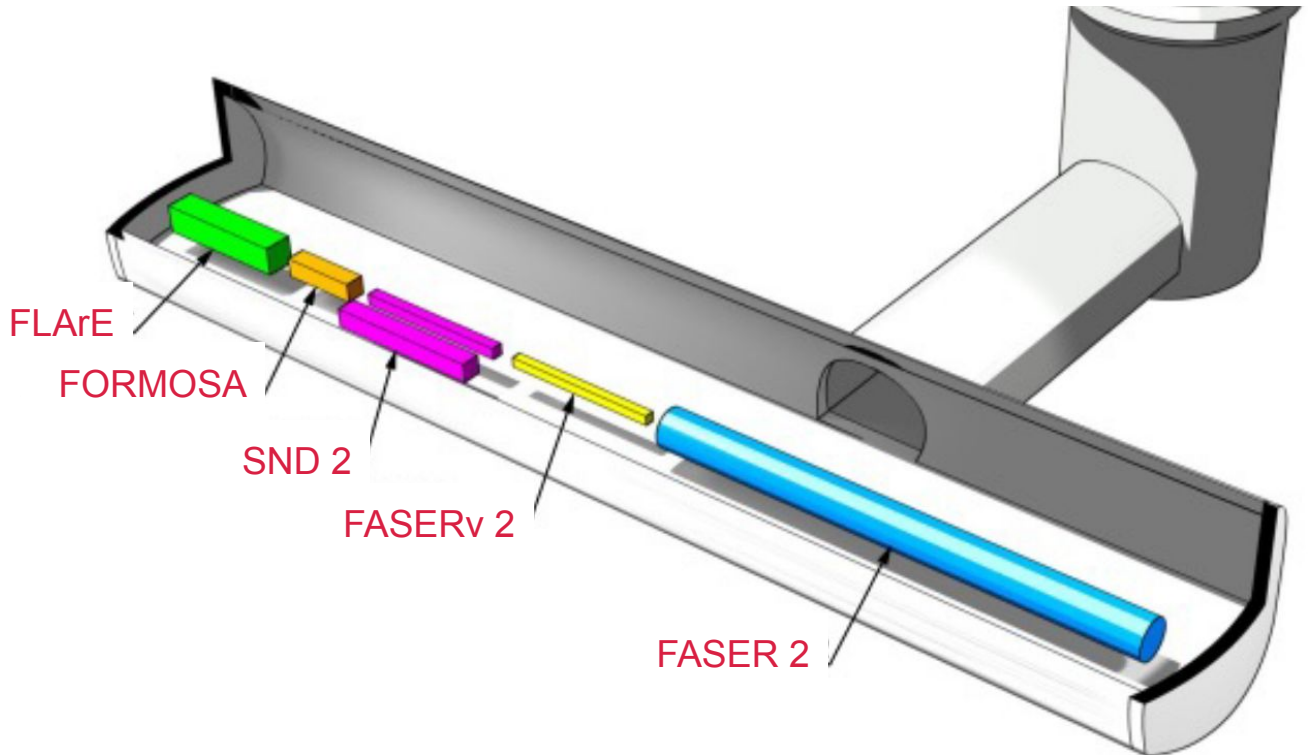






# Physics Potential

The FPF would house a suite of experiments that will greatly enhance the LHC's physics potential for **BSM physics searches**, **neutrino physics** and **QCD**.



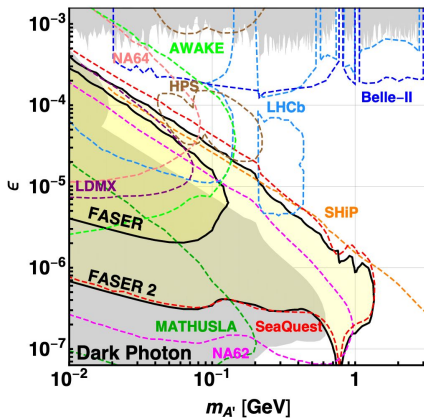
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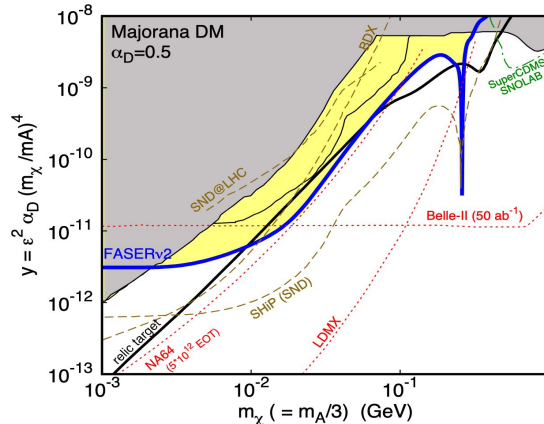
## BSM Physics:

- **long-lived particle** searches with **FASEr 2**
- **DM scattering** searches with neutrino detectors, **FASEr v 2**, **SND 2**, **FLArE**
- **millicharged particles** searches with **FORMOSA**

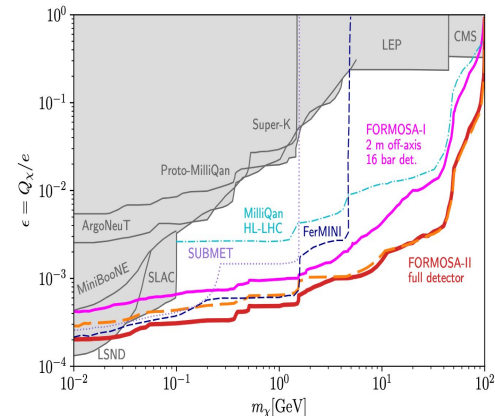
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2010.07941



→ see Sebastian's talk

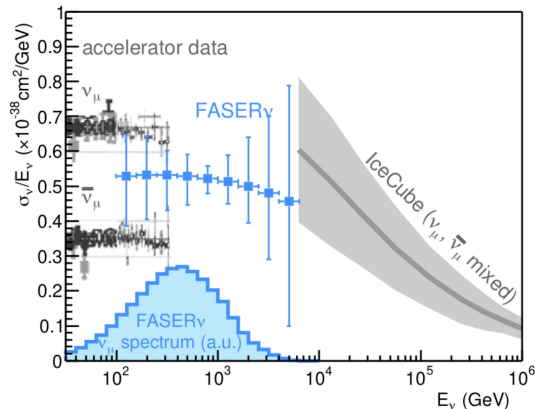
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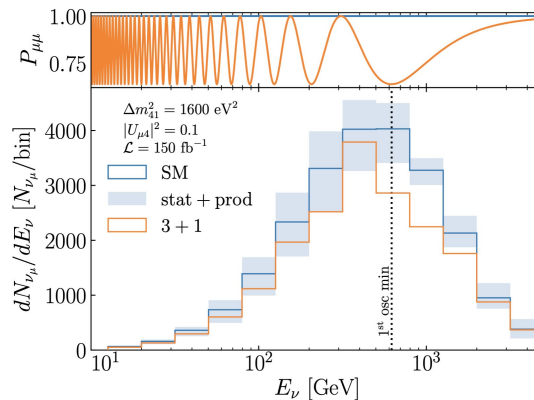
## Neutrino Physics:

- about 100k electron, 1M muon and few 1000 tau neutrinos at **FLArE**, **FASERv 2**
- measurement of **neutrino cross section** at TeV energies
- **tau neutrino** precision physics
- neutrino related **new physics**: NSI, neutrino magnetic moments, sterile neutrino oscillations, sterile neutrino decay, neutrinophilic DM, ...

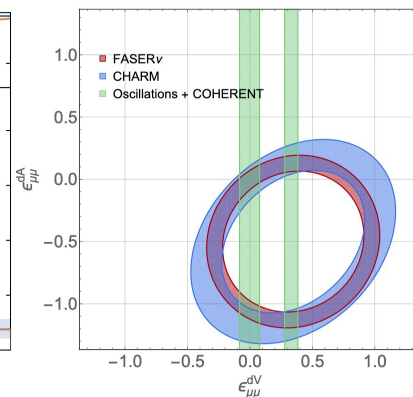
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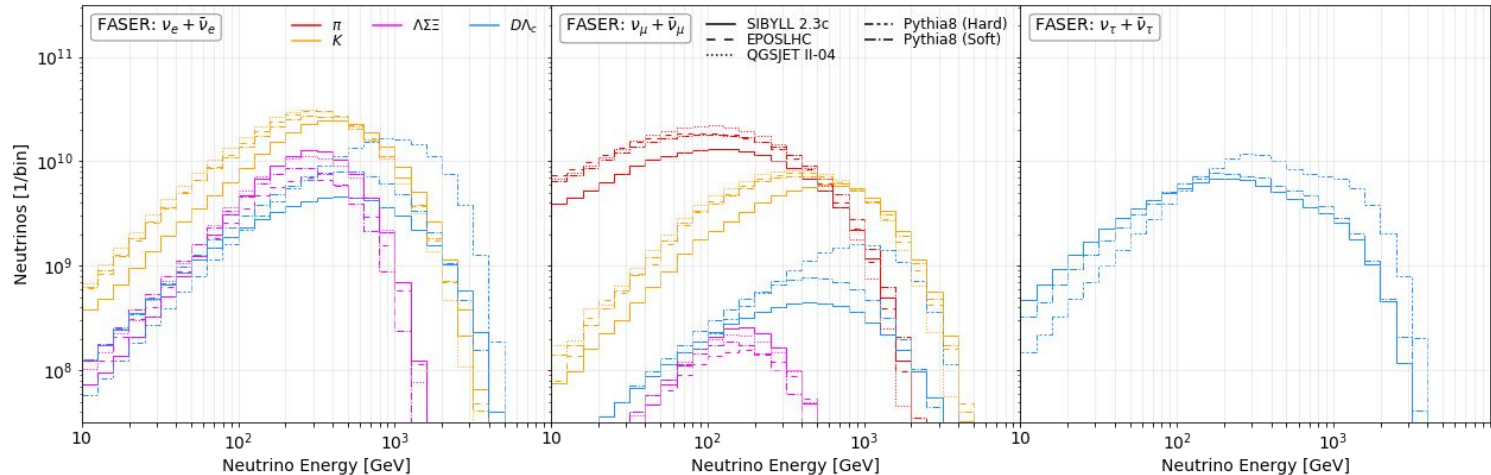


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## QCD:

- forward neutrinos originate from forward hadron decays

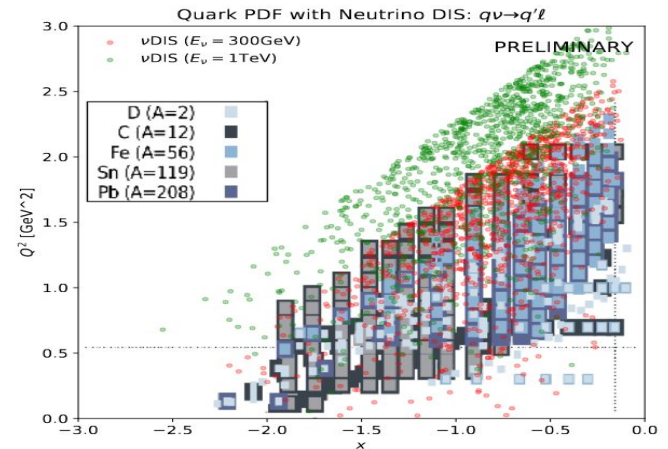
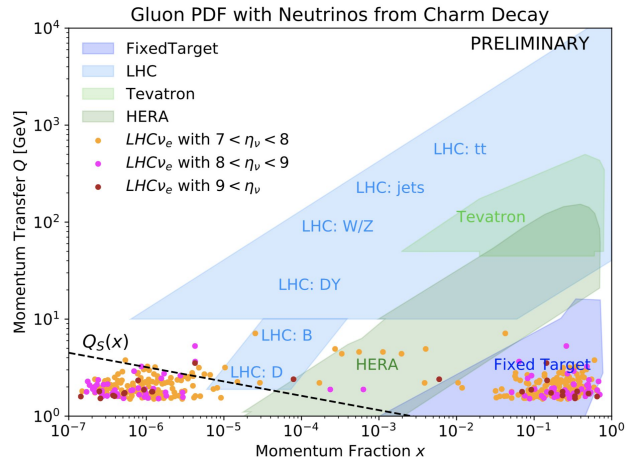


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## QCD:

- forward neutrinos originate from forward hadron decays
- improve/validate **hadronic interaction models**
- neutrinos from charm decay could allow to test transition to **small-x factorization** and **gluon saturation**, constrain **low-x gluon PDF**, and probe **intrinsic charm**
- provide valuable input for **astro-particle physics**
- constrain **PDFs** via **DIS neutrino scattering**



# Next FPF Meeting

Upcoming 2nd FPF workshop on May 27th/28th will discuss these topics in great detail.

<https://indico.cern.ch/event/1022352>

The PPC community is invited to join!

The screenshot shows the Indico event page for the "2nd Forward Physics Facility Meeting". The event is scheduled for 27-28 May 2021 in Europe/Zurich. The page includes a navigation menu with options like "Overview", "Call for Abstracts", "Timetable", "Contribution List", "Book of Abstracts", "Registration", and "Participant List". The "Overview" section is active, displaying the event title, start and end times, and the organizers: Jonathan Lee Feng, Maria Vittoria Garzelli, and Felix Kling. A message states "There are no materials yet." Below this, an information icon is followed by a paragraph explaining the meeting's purpose: to present the status of the proposal for a forthcoming FPF at the Large Hadron Collider and to discuss related physics opportunities. It mentions that the material will serve as the basis for a forthcoming Letter of Interest and White Paper. A note specifies that the whole event will be held online. At the bottom, there are two call-to-action buttons: "Submit new abstract" (with the text "The call for abstracts is open" and "You can submit an abstract for reviewing.") and "Register now" (with the text "Registration for this event is currently open." and a count of 59 registrants).

## 2nd Forward Physics Facility Meeting

27-28 May 2021  
Europe/Zurich timezone

Search...

- Overview
- Call for Abstracts
- Timetable
- Contribution List
- Book of Abstracts
- Registration
- Participant List

Jonathan Lee Feng, Maria Vittoria Garzelli, Felix Kling

- [jlf@uci.edu](mailto:jlf@uci.edu)
- [maria.vittoria.garzelli@d...](mailto:maria.vittoria.garzelli@d...)
- [flxking@gmail.com](mailto:flxking@gmail.com)

**Starts** 27 May 2021, 16:00  
**Ends** 28 May 2021, 21:00  
Europe/Zurich

Jonathan Lee Feng  
Maria Vittoria Garzelli  
Felix Kling

There are no materials yet.

**i** This 2nd Forward Physics Facility (FPF) Meeting aims to present the status of the proposal of a forthcoming FPF at the Large Hadron Collider, and to discuss and explore the related physics opportunities. The material and work of the participants will serve as the basis for a forthcoming Letter of Interest and White Paper. First discussions in this respect have taken place in the context of the Snowmass 2021 process.

The whole event will be held online.

For the FPF Kickoff Meeting, see <https://indico.cern.ch/event/955956>.

**The call for abstracts is open**  
You can submit an abstract for reviewing. [Submit new abstract](#)

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