

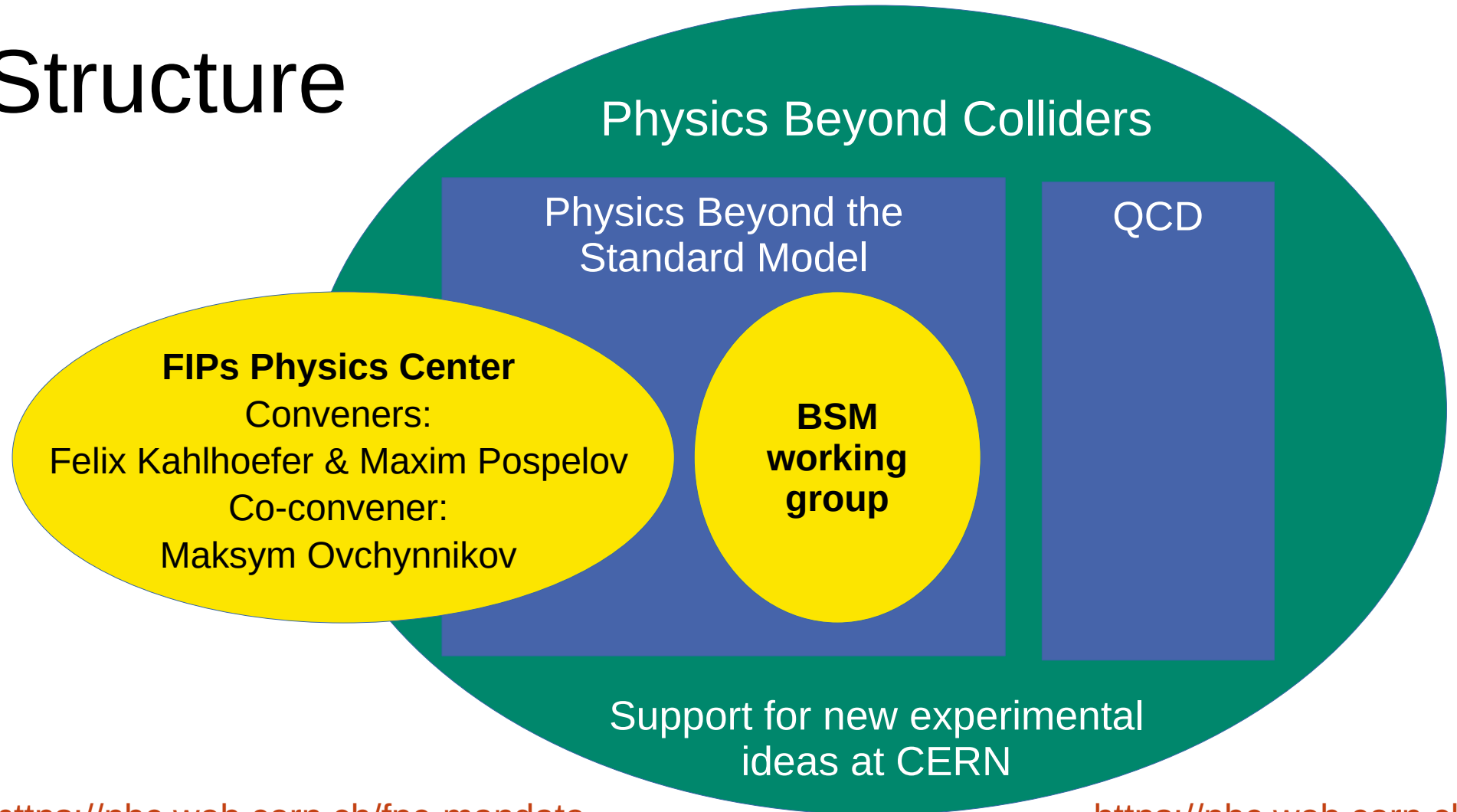
First bi-weekly meeting of the FIPs Physics Center (FPC)



11 September 2024

FIPs: Feebly-interacting particles, i.e. particles that interact much more weakly than any known particles. For such particles to be detectable, they typically must be light (keV-GeV scale) or even ultralight (eV and below)

Structure



Purpose of the FPC

- **For the entire community:** Development of models, definition of benchmarks, detailed studies of production and decay channels, hands-on instructions for simulations
- **For PBC experiments:** Complement the BSM working group by providing theory support (sharpening of science case, comparison of sensitivities, identification of opportunities)
- Organisation of future FIPs workshops / schools, following the successful events in 2020, 2022 and 2024 (depending on available resources).

What the FPC is not

- The FPC does not have its own budget and cannot provide funding (neither for meetings nor for experimental studies / development)
 - The FPC does not provide recommendations that influence funding decisions
- Community platform to enhance visibility of FIPs physics, strengthen the experimental case and provide support for design studies / proposals

Specific goals

- **Short-term (next six months):** Contribution to the European Strategy Update for Particle Physics
 - Common PBC document in preparation
- **Medium-term (next year+):** Update of FIPs benchmarks
 - Reduced (or at least quantified) theory uncertainties
 - Improved (and documented) strategies for signal simulation
 - New benchmark models

Three types of contributions

- Presentation of recent results, updates on experimental status etc.
- Request for help / support from the community
 - Is this model interesting?
 - How do I simulate model X at experiment Y?
 - Can I use experiment Y to look for model X?
- Propose projects / recruit collaborators
 - Would calculation Z be useful for anyone?
 - Does anyone want to help with carrying out calculation Z?

How to contribute

- Presentations at bi-weekly meetings (open for all theorists & experiments from the community), see <https://indico.cern.ch/category/13866/>
- Creation of sub-groups with focused meetings
- Mailing list(s), see <https://pbc.web.cern.ch/fpc-mandate> for list of members
- Mattermost workspace on CERN server:
https://mattermost.web.cern.ch/signup_user_complete/?id=w65n1pnnxtgfbc3761gwbt5o&md=link&sbr=su

Spread the word – recruit more contributors!

European Strategy Update

- **“Summary Report of the Physics Beyond Colliders Study at CERN”**
- Focus on PBC experiments (early stage proposals, based at CERN and benefiting from CERN expertise/infrastructure)
- **Section 5:** Physics reach of PBC projects in the global context
- Could be complemented by additional short documents on specific topics
- **Timeline:** Completion by early 2025 (first full draft before end of 2024)

→ Maksym

Loose ends

- In 2022 the FPC started working on the definition of new FIPs benchmarks
 - HNLs with realistic coupling structure: <https://arxiv.org/abs/2207.02742>
 - ALPs with couplings to gauge bosons: <https://arxiv.org/abs/2004.01193>
- Benchmarks are theoretically well-defined but the phenomenology is not yet fully explored / documented
- SHiP dominates most current FIPs benchmarks
- Need new benchmarks that can be targeted by LHC forward & large-angle detectors

Discussion

- What else is needed?
- What are we missing?