

Physics Beyond Colliders Working Group Meeting
CERN – March 1-2, 2017

Joint Discussion Session
with Theory Institute
“New Physics at the Intensity
Frontier”





Three main scientific pillars

Full exploitation of the LHC → over the period of this MTP:

- ❑ successful Run 2, LS2, and Run 3 start-up
- ❑ construction and installation of LIU; on-track construction of HL-LHC

Scientific diversity programme serving a broad community:

- ❑ ongoing experiments and facilities at Booster, PS, SPS and their upgrades (ELENA, HIE-ISOLDE)
- ❑ participation in accelerator-based neutrino projects outside Europe (presently mainly LBNF in the US) through CERN Neutrino Platform

Preparation of CERN's future:

- ❑ vibrant accelerator R&D programme exploiting CERN's strengths and uniqueness (including superconducting high-field magnets, AWAKE, etc.)
- ❑ design studies for future accelerators: CLIC, FCC (includes HE-LHC)
- ❑ future opportunities of diversity programme (new): "Physics Beyond Colliders" Study Group

Important milestone: update of the European Strategy for Particle Physics (ESPP): ~ 2019-2020
→ 10-year view has uncertainties beyond 2020 for part of programme other than LHC upgrade

Fabiola Gianotti SPC May 2016

Ambitious Aims

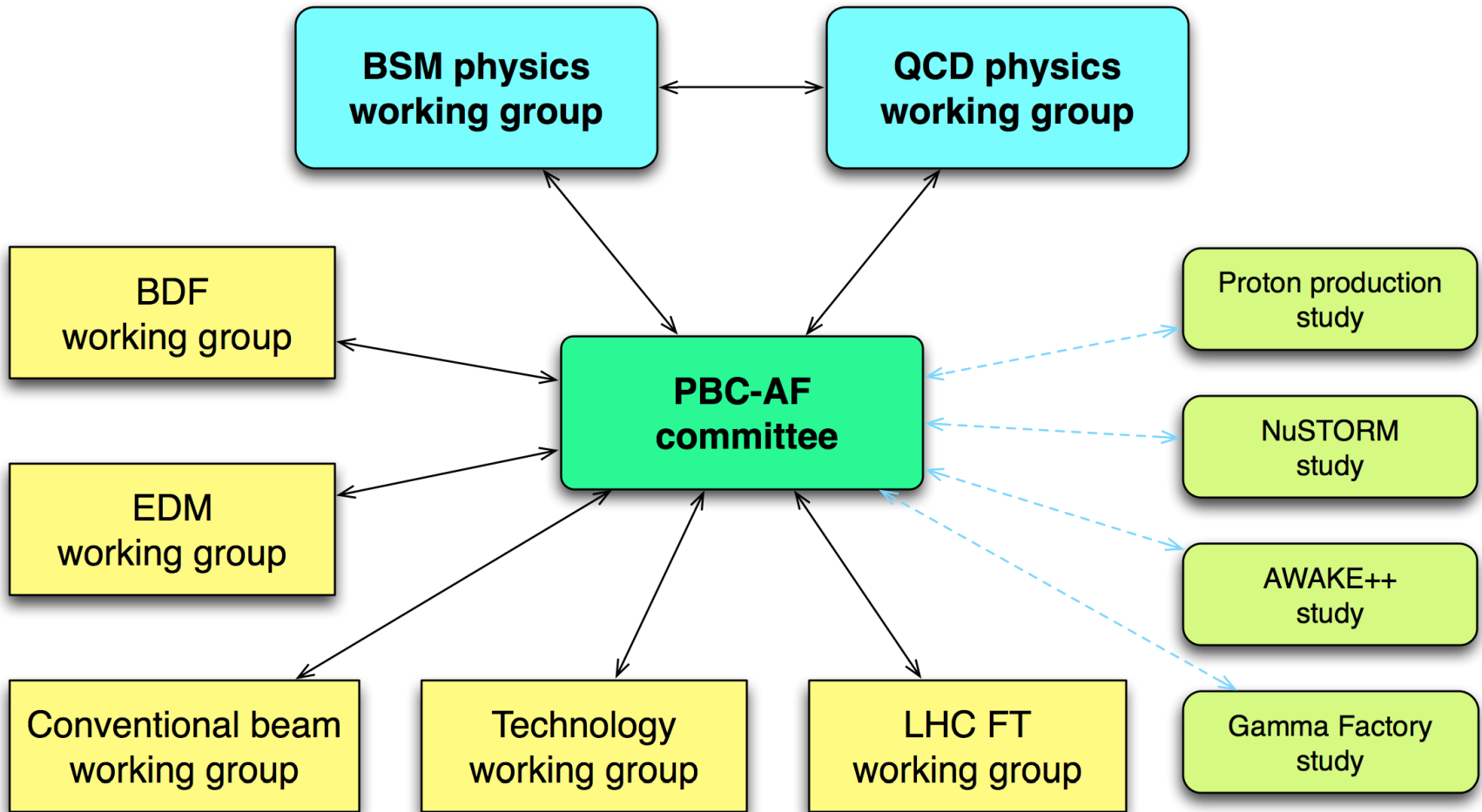
- Physics Beyond Colliders study to look at CERN's non-collider options out to 2040
- Explore the opportunities offered by the CERN facilities to address some of today's outstanding questions in particle physics

Ambitious Aims

- Physics Beyond Colliders study to look at CERN's non-collider options out to 2040
- Explore the opportunities offered by the CERN facilities to address some of today's outstanding questions in particle physics

Find New Stuff!!!

Organisation



Things to do...

- Already a nice set of proposals!
 - ➔ Evaluate physics case in worldwide context
 - Motivation for the searched for physics
 - Sensitivity compared to other existing experiments
 - Complementarities?
 - ➔ Can the experiment be improved?
 - Synergies between different proposals or existing experiments

New Ideas...

- Always open to new ideas/proposals!
 - Are there “holes” in the existing parameter space that cannot be probed with existing/proposed experiments?
Is it possible to close them?
 - Ideas to improve sensitivity?

Questions

- **Fundamental theory questions:**
 - What particles are preferred by extensions of the SM?
 - Do we have preferred mass ranges to target?
 - Are there coupling strengths that are suggested by theory?

More questions

- **Connections:**

- Are some of the predictions correlated? That is, if we see (or not) particles in one experiment can we say something about the predictions in another experiment?
- Are there other connections of the type: EDM experiments \leftrightarrow axion searches?

And even more of them...

- **Coherent picture:**

- Can we draw a coherent picture of a landscape where the experiments cover a wide range of fundamental physics questions?
- In such a picture would it be possible to sketch a coherent global experimental program exploiting the connections above, including a prioritisation of domains to explore ?
- Are there holes in this picture where experiments (or even experimental techniques) are currently lacking?

Not finished yet

- **Full exploitation:**
 - New ideas to exploit existing or proposed experiments? -
 - Ideas for the improvement of experiments?

Weird idea...

- Database for “old” experiments and their data
- There are many old experiments that have impact on the things we are looking for.
- We want to avoid duplication
- Often theorists looking at those old experiments (do not always really understand the data)
- It’s often hard to get all the required information
 - ➔ Would it make sense to try and collect all this information in a database?
 - ➔ Perhaps do it with “collective memory” wikipedia style

Conclusions

- To be written... by YOU