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
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Find New Stuff!!!
Organisation

BSM physics working group
QCD physics working group
PBC-AF committee

BDF working group
EDM working group
Conventional beam working group
Technology working group
LHC FT working group

Proton production study
NuSTORM study
AWAKE++ study
Gamma Factory study
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 <-> 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