Postdoctoral position (experimental physics) on muon colliders, CEA Saclay/INFN Trieste

LHC matching

Fabrice Balli[1], Massimo Casarsa[2]

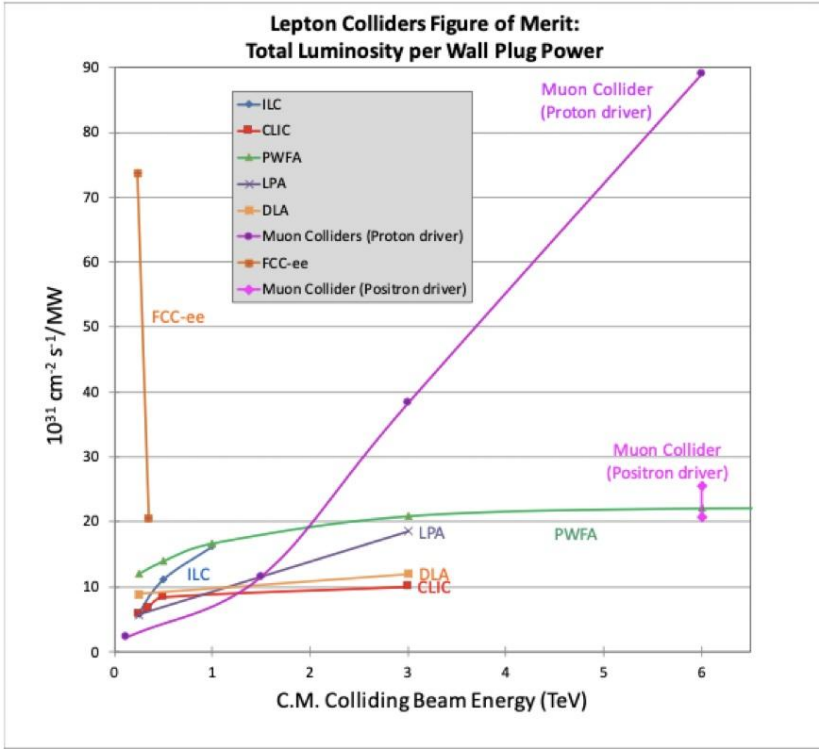
https://inspirehep.net/jobs/2668287

1 : CEA Saclay, 2 : INFN Trieste

Funded by the European Union

Topic of interest

- R&D on future accelerators
  - Muon collider is a very interesting option for the future of HEP
    - High physics potential (Higgs factory, rich BSM physics programme…)
      - Unique place to study Higgs self coupling
    - Sustainability
  - Discussed in the European strategy for particle physics accelerator roadmap [1]
  - Young collaboration is forming https://muoncollider.web.cern.ch/
- R&D on the accelerator complex is high priority for the collaboration but **detector R&D and exploration of the physics potential are also fundamental**



Taken from [2]

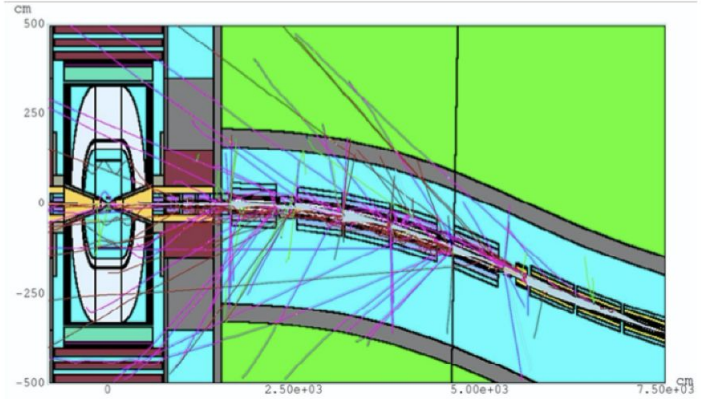
[1] : European Strategy for Particle Physics -- Accelerator R&D Roadmap, arXiV: 2201.07895

[2] :The future prospects of muon colliders and neutrino factories, Manuela Boscolo (Frascati), Jean-Pierre Delahaye (CERN), Mark Palmer (Brookhaven Natl. Lab.) arXiV : 1808.01858

Topic of interest

- Muon collider experiment will have to deal with large beam-induced-background
  - Decaying muons across the full beam line
  - Electrons, photons, neutrons, muons

- Project : explore HH→ bb$\tau\tau$ sensitivity under such conditions
  - Small background, relatively large BR
  - Development of τ reconstruction (unexplored today), whose precision is essential for the sensitivity of this channel, and study of b-jet reconstruction and tagging performance.



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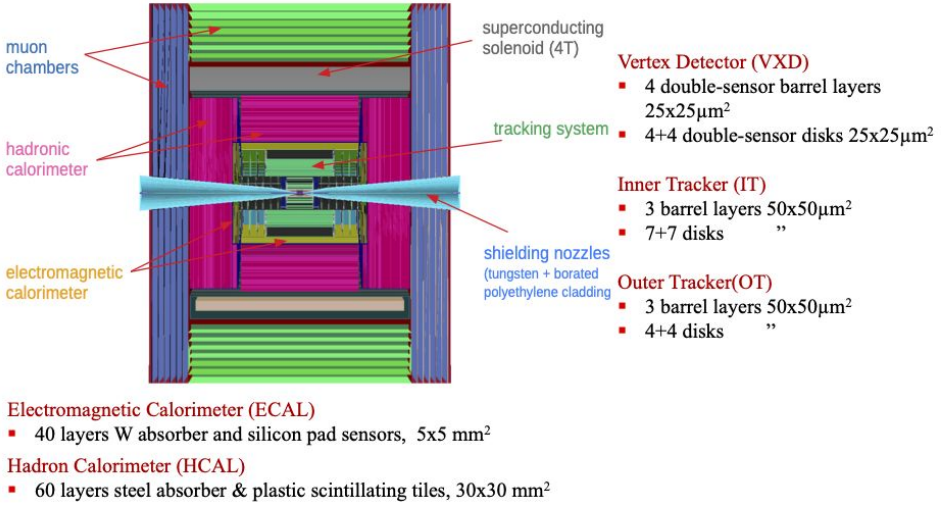
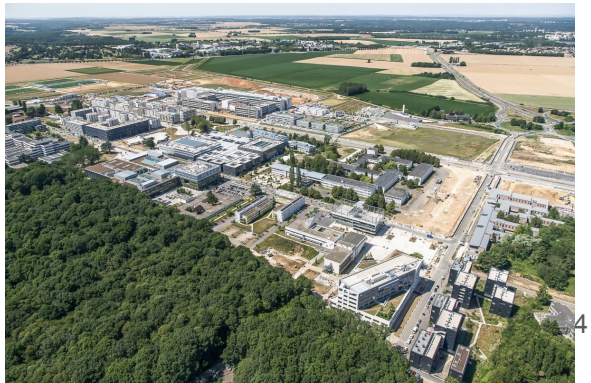


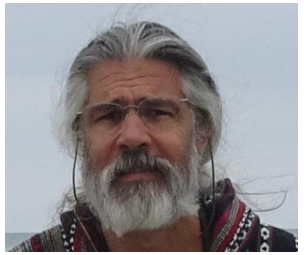
Location

- 1 year in CEA Saclay, 1 year (possibly 2) in Trieste
  - Preferably in this order
- Teleworking is possible, to be discussed
  - Not 100%
- CEA Saclay : located on the plateau of University Paris-Saclay, large scientific pole in the Paris area
  - In the vicinity of Ecole Polytechnique, IJCLab, ENS Paris-Saclay…
- Trieste : in the North-East of Italy, close to the border with Slovenia
  - Theoretical and experimental physics community



Group members (1/2)

- INFN Trieste :
  - **Massimo Casarsa – advisor in Trieste**
    - Also involved in CMS
    - Strongly involved in muon collider collaboration - responsible for detector performance and Machine-Detector Interface (MDI) studies



- CEA Saclay : ramping phase
  - Fabrice Balli - based at CERN
  - Laurent Chevalier
  - Pierre-Francois Giraud

  } Involved in ATLAS

  - **Gautier Hamel de Montchenault**
  - **Federico Ferri**
  - Philippe Gras

  } Involved in CMS, **main advisors in Saclay**

Regular team meetings, will become weekly/every 2 weeks in addition of the day to day follow up ; weekly meetings inside the collaboration

Group members (2/2)

- Various expertise from the different members from past/ongoing experiments
  - Flavour physics
  - Higgs, Top, Standard Model
  - Detectors (e.g. muon spectrometry)
  - Magnetic fields
- Synergy with accelerator department (DACM) in CEA Saclay
  - Antoine Chancé
    - Coordinator of WP5 in MuCol (High energy complex)
  - Claude Marchand
    - Coordinator of WP6 in MuCol (Radio frequency systems)
      - https://mucol.web.cern.ch/
  - Lionel Quettier
    - Head of Laboratoire d'Etudes des Aimants Supraconducteurs

Summary

- If you are interested in the future of HEP and want to work on an innovative option : come and join us !
  - Looking for someone having a PhD in experimental particle physics

    Expected deliverables : tau and b-jet performance studies
    HH→bbtautau sensitivity
    Studies on detector design (if time allows)

- Starting date : aiming for end of the year (can be flexible)
- Details on how to apply : https://inspirehep.net/jobs/2668287
  - You can also contact me directly at fabrice.balli@cern.ch and we can organise a chat!

Other useful references :

- [3] : Full Detector Simulation with Unprecedented Background Occupancy at a Muon Collider, Bartosik, N., Andreetto, P., Buonincontri, L. et al.. Comput Softw Big Sci 5, 21 (2021). https://doi.org/10.1007/s41781-021-00067-x
- [4] : Electroweak couplings of the Higgs boson at a multi-TeV muon collider, Tao Han, Da Liu, Ian Low, Xing Wang *in* Phys.Rev.D 103 (2021) 1, 013002