

# FCC Group – Future Circular Collider



LIP Advisory Board Meeting  
19 April 2024  
Ricardo Gonalo – UC / LIP



Fundação  
para a Cincia  
e a Tecnologia

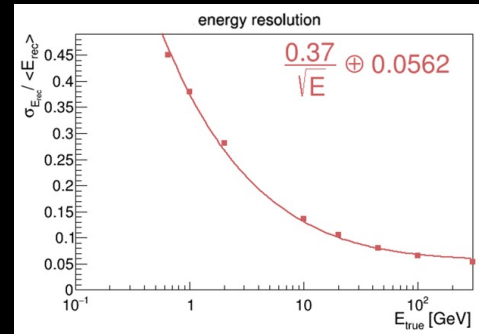
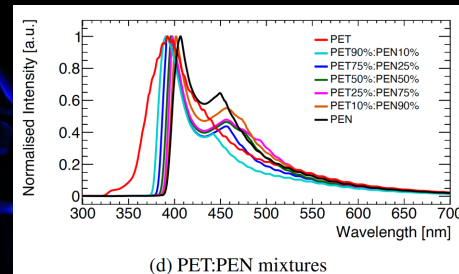


# FCC Group

Group dedicated to future collider studies – main focus on FCC-ee  
Participating in ECFA Detector R&D roadmap – DRD6: Calorimetry

## Activity:

- Rad-hard scintillator development
  - Preprint: arXiv:2312.14790
- Allegro detector concept for FCC-ee
  - Simulation of calorimeter design
  - High Granularity HCAL / Iron Yoke:
    - Scintillator + Iron
    - SiPMs directly on Scintillator or
    - TileCal: WS fibres, SiPMs outside



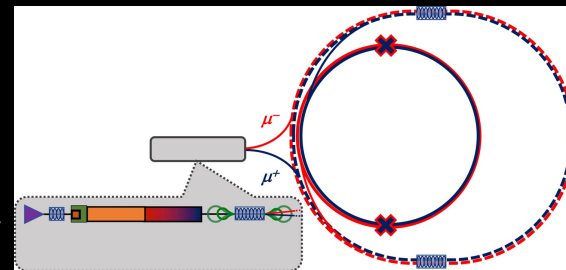
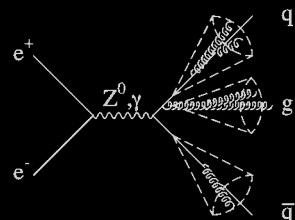
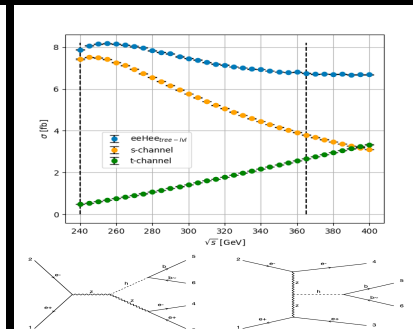
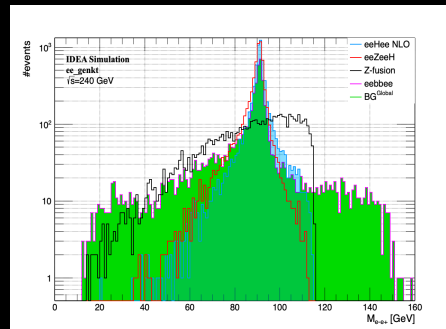
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## Physics studies

### Activity:

- Higgs at FCC-ee
  - MSc thesis on of  $e^+e^- \rightarrow e^+e^-H$  Higgs production  
<https://estudogeral.uc.pt/handle/10316/110491>
  - Goal was to assess sensitivity to NLO effects incl.  $\lambda_{HHH}$ :  $3.6\sigma$  ( $1.6\sigma$ ) at 240 GeV (365 GeV)
- 3-jet cross section and event shapes
  - Preparing for ultra-precise measurement of  $\alpha_s$  at FCC-ee Z-pole run
  - MSc thesis in preparation
- Muon collider
  - Review article on status of muon colliders design, physics and detector studies.  
Accettura, et al. including G. Chachamis, G. Da Molin, M. Gallinaro, "Towards a muon collider", Eur. Phys. J. C 83, 864 (2023)



# Strengths, Weaknesses, Opportunities and Threats

- **Strengths:**
  - Experienced team from different LIP sites and universities – access to students
- **Weaknesses:**
  - Little researcher time devoted to FCC – not the only interest of most people in the group
- **Opportunities:**
  - Contributing to feasibility study – long-term, unique facility in particle physics
  - Good opportunity for student training
  - Technological studies have wide applicability
- **Threats:**
  - Shortness of dedicated research time

## Funding:

Submitting an application for upcoming Fundo CERN (PI: I.Ochoa)

PI	Co-PI	Amount	Dates	Project / Description
Michele Gallinaro		115.000 €	2022-01-01 / 2025-12-31	aAmuse - Project 101006726 / aAmuse - advanced Muon Campus in US and Europe contribution
João Nuno Pires	Ricardo Gonçalves	15.000 €	2022-04-01 / 2024-03-31	CERN/FIS-PAR/0035/2021 / PPatFCC_Participação Portuguesa no Futuro Colisionador Circular (FCC)
Michele Gallinaro		40.000 €	2023-03-01 / 2027-02-28	MuCol - Proposal 101094300 / A Design Study for a Muon Collider complex at 10 TeV center of mass

**Team:** Grigorios Chachamis, Rudnei Machado, Guilherme Milhano, Inês Ochoa, João Nuno Pires, Michele Gallinaro, Patricia Conde, Rute Pedro, Beatriz Pinheiro Pereira (PhD), Francisco Casalinho (MSc – now PhD at UCLouvain), Joana Reis (MSc)



# Bonus slides



LET'S INSPIRE PEOPLE



# Status of Global FCC Collaboration

