The APC ATLAS/FCC team

Gregorio Bernardi, Marco Bomben and Giovanni Marchiori

TDLI delegation visit

APC, 21 May 2026

Team composition

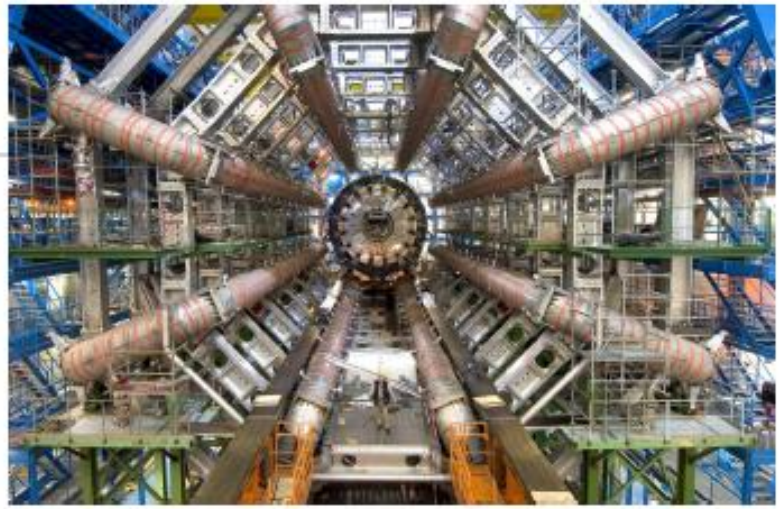
- 3 staff members
  - Giovanni Marchiori - CNRS DR, team leader
    - Former convener in BaBar and ATLAS working groups (photon performance, SM photon cross-sections, Higgs to photons). Currently ATLAS Speakers Committee chair and responsible of simulation and reconstruction for one FCC detector concept (ALLEGRO)

  - Gregorio Bernardi - CNRS DR, deputy team leader
    - National responsible of FCC-France activities. Former spokesperson and Higgs convener of D0 experiment, current convener of FCC International Forum of National Contacts

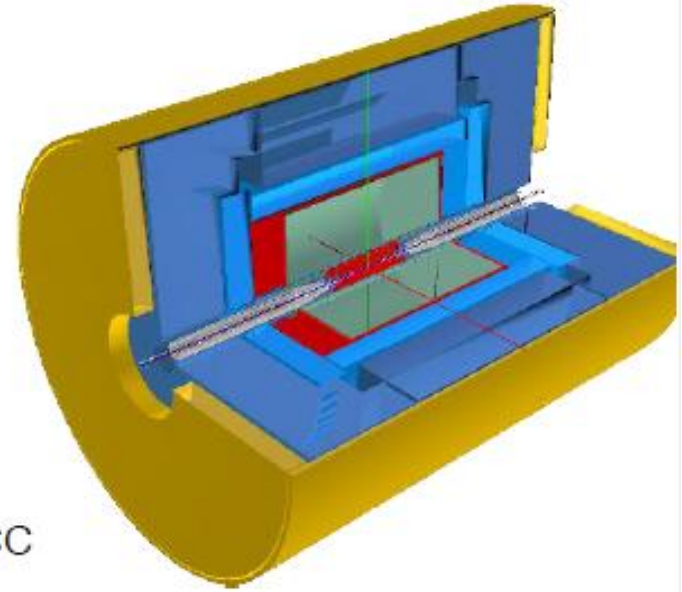
  - Marco Bomben - Associate professor at UPCité
    - World expert in silicon detectors. Convener of ATLAS radiation damage simulation working group, for both current and future silicon detectors

- And a variable number of students/post-docs

Team activities



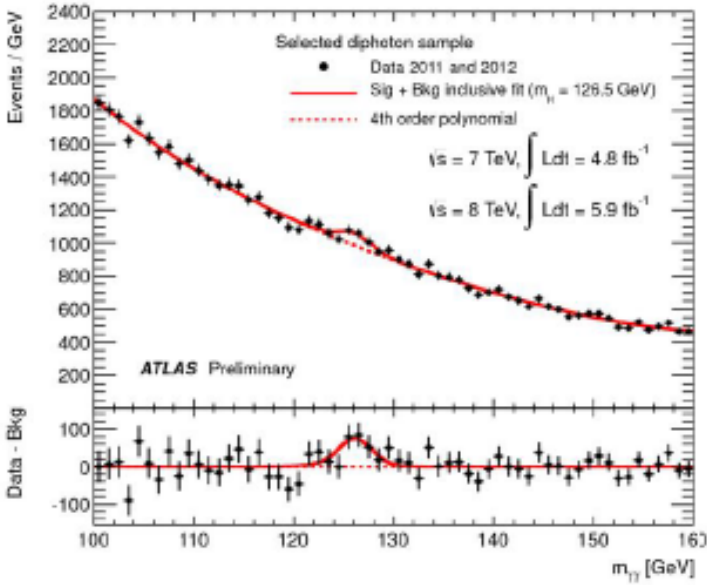
- Main physics topics studied by the team: the Higgs boson at present and future detectors/particle colliders: ATLAS/LHC and ALLEGRO/FCC at CERN
  - Scalar particle associated to the Higgs field
  - Possibly related to various fundamental questions about the universe:
    - Breaking of electroweak symmetry
    - Origin of mass of fundamental particles
    - Possible source of extra CP violation needed for matter-antimatter asymmetry?
    - Possible role in inflation?
    - Portal to dark matter?

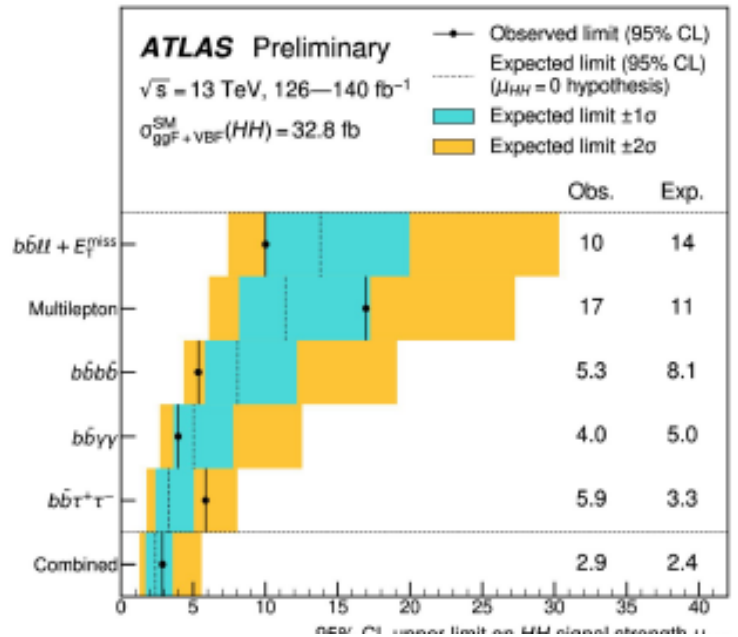


- Detector and performance work towards supporting precision Higgs physics with ATLAS and FCC
- Miscellanea: teaching (M. Bomben) / contributing to outreach initiatives / organisation of several international conferences and schools
- Supervision/training of several students and post-docs (few students/year in the team)

Selected team results

- A few highlights of Higgs physics results with important contributions from the team
  - Discovery of the Higgs boson through its decays to photon pairs (LHC Run1)
  - Observation of Higgs boson coupling to fermions in Higgs boson decays to b-anti-b quark pairs (Run 2)
  - Evidence of rare decays of Higgs boson to a Z boson and a photon (Run 2)
  - Precise measurements of Higgs boson mass, cross-sections (Run 2/3)
  - Most precise constraints on Higgs boson self-coupling through searches for di-Higgs production (Run 2)
  - and also:
    - searches for beyond-Standard Model physics in e.g. Higgs-like resonances, dark matter produced in association with Higgs bosons
    - Sensitivity studies of Higgs boson branching ratios and Yukawa couplings at FCC
    - Expected precision on the ZH cross section and the Higgs mass at FCC-ee





Partnerships with Chinese institutions

- Collaboration with Chinese institutes working on ATLAS within the framework of a bilateral “international research network” (IRN) FCPPN between CNRS/IN2P3 - CAS+Chinese Universities
  - Past collaborations: IHEP-Beijing, USTC-Hefei IN2P3 P.I. : G. Marchiori
  - Current collaboration: SJTU/TDLI IN2P3 P.I. : G. Bernardi
- Ex-students and current students:
  - Kun Liu (currently at TDLI) First PhD student, co-supervised with Prof. Yanwen Liu at USTC
- Other students jointly supervised with Chinese partners
  - G. Marchiori: Changqiao Li (USTC), Qiuping Shen (SJTU) w/ Haijun Yang ; Dian Yu (SJTU/TDLI, w/ Kun Liu
  - G. Bernardi: Yulei Zhang (SJTU) w/ Liang Li
- Current French students collaborating on joint topics:
  - Alexis Maloizel (G. Marchiori)
  - Tom Fournier (G. Bernardi)

Interest and good potential for further collaboration in the future