23/06/2020

RD-FA Bologna group meeting

P. Giacomelli

News

- European Strategy Update!
  - Highest priority is a Higgs factory (FCC-ee) with an extension to a 100 TeV machine in the future (FCC-hh)

Preamble

The European vision is thus to prepare a Higgs factory, followed by a future hadron collider with sensitivity to energy scales an order of magnitude higher than those of the LHC, while addressing the associated technical and environmental challenges.

Statement

a) An electron-positron Higgs factory is the highest-priority next collider. For the longer term, the European particle physics community has the ambition to operate a proton-proton collider at the highest achievable energy. Accomplishing these compelling goals will require innovation and cutting-edge technology:
   - *the particle physics community should ramp up its R&D effort focused on advanced accelerator technologies, in particular that for high-field superconducting magnets, including high-temperature superconductors;*
   - *Europe, together with its international partners, should investigate the technical and financial feasibility of a future hadron collider at CERN with a centre-of-mass energy of at least 100 TeV and with an electron-positron Higgs and electroweak factory as a possible first stage. Such a feasibility study of the colliders and related infrastructure should be established as a global endeavour and be completed on the timescale of the next Strategy update.*

The timely realisation of the electron-positron International Linear Collider (ILC) in Japan would be compatible with this strategy and, in that case, the European particle physics community would wish to collaborate.

Good news for RD-FA and IDEA!

More news

- RD-FA will be split in 2021 in:
  - RD-FCC
    - Activities for both FCC and CEPC
      - Most of these will be IDEA-based as it is considered for both FCC-ee and CEPC (is already in both CDRs)
    - Muon collider
    - Other activities that are not synergic with the two labels above will have to proceed separately...

- We have our first RD-FA laureanda in Bologna!
  - A warm welcome to Valentina Diolaiti

Consequences of EPSU

- Expect FCC-ee TDRs for detectors around 2027
  - Possible FCC approval by next EPSU ~2026-2027
- CEPC aims at:
  - Making the short list of 4-5 international project located in China by 2021
    - Of these 1-2 will receive official approval in 2023
    - Detectors TDR around 2024-2025
- Therefore TDRs are not so far away
  - R&D on technologies will likely have to end ~1 year before TDRs
  - We have about 3-4 years of R&D to validate technologies and arrive at a "final" design of the full detector

Bologna activities

- R&D on μRWELL detectors
  - Considered for the Preshower and the muon detection system of the IDEA detector concept
  - Involved on the detector design, electronics and software
  - Activity ongoing since 2-3 years
- R&D on the Dual Readout calorimeter
  - Involvement on the readout electronics for SiPMs
  - New activity, barely started
- Simulation and software
  - Simulation, Full and Fast (DELPHES) of some of the IDEA sub-detectors
  - Analysis of some benchmarks physics channels
  - Optimisation of the detector
  - Activity ongoing since a couple of years

Bologna activities

- Common software framework
  - We organised a workshop in Bologna in June 2019 where a decision to develop a common software framework, KEY4HEP, for all future HEP experiments, was reached
    - Includes a common event data model, EDM4HEP
    - Based on Gaudi
    - Includes most widely used libraries and tools
    - Developers coming from ILC, FCC, CEPC, CLIC, etc.
  - We also organised a second workshop in Hong Kong (January 2020)

Bologna responsibilities

RD-FA

- WP on MPGDs coordinator (P. Giacomelli)
- WP on Physics and software (S. Braibant)

FCC-ee and CEPC

- FCC-ee speakers bureau member (P. Giacomelli)
- co-Chair of the 2019 CEPC International workshop (P. Giacomelli)
- co-organiser of the HKUST IAS conference in Hong Kong (P. Giacomelli)
- member of the Scientific committee of the 2020 CEPC International workshop (P. Giacomelli)

Future activities

- Submitted to RD-FA referees a proposal (~20 keuro) to realise a large μRWELL (~50x50 cm^2) detector rather similar to a "final" μRWELL module for IDEA readout with the Tiger ASIC
  - Would use the Gas lab at level -1 of Berti Pichat with its large cosmic ray telescope
  - Preparing a request to INFN Bologna to equip the cosmic telescope with two layers of scintillators to provide a trigger over the whole surface (2x1.3 m^2)
- Optimisation of the IDEA sub-detectors
  - Will use fast and full simulations
- DR calorimeter electronics
  - Asked for a person from the Bologna electronics pool at 50% in order to study existing ASICs (Citiroc and Siread) and their evaluation boards
- e^+e^- MC physics development

Other future activities

- LHCb is thinking about an upgrade for LHC Run 5
  - Several activities are, or could be, VERY synergic with RD-FCC
    - μRWELL R&D - already developed together since a bit more than a year
    - TOF system
      - LHCb would use to reduce PU, for IDEA could be useful for PID
    - Real time analysis
      - LHCb is preparing for extreme conditions of DAQ and trigger less operations which are of great interest also for, especially, the very high-luminosity Z pole run at FCC-ee of CEPC
    - Vertex detector with Timespot technology

Plenty of interesting opportunities in RD-FCC for newcomers!

EU grants

- We have been rather successful in obtaining EU grants
  - FEST 2.1 Meuro
    - RISE project that provides travel money to go to IHEP (Beijing) and Hong Kong to work on CEPC
    - Will also provide some AR, with at least 1 in Bologna
    - Started in January 2020, ends at the end of 2023...
  - URANIA (ATTRACT phase 1) 100 keuro
    - Spin-off activity of μRWELL to realise a thermal-neutron detector
  - AIDAinnova 10 Meuro
    - Proposal submitted mid-May 2020
    - Should know the result around mid-October
    - Could start in February-March 2021
      - IDEA will receive ~ 500 keuro (in 4 years)
      - Bologna will receive 170 keuro, 50 keuro (2 years of AR) for work on electronics for μRWELL

Italian grants

- μRWELL detectors
  - Preparing a proposal for CSN5
- DR calorimeter
  - Submitted 2 weeks ago a proposal for a CSN5 call
    - Funds requested ~ 1 Meuro
      - Bologna would receive 2 years of AR plus money for electronics development
- We have won a CC3M grant (5 keuro) for outreach!
  - We will produce a short movie with interviews of common people on what is scientific research for them

2020 Conferences and workshops

- This year is very special, however we still had some conferences or workshops where FCC-ee or CEPC talks were asked for
  - FCC France days in May
  - LHCP 2020 also in May
  - ICHEP 2020
    - several talks and a few posters have been offered
      - One of us (F. Maltoni) will give a plenary talk! (non just FCC or CEPC)
- CEPC International workshop at the end of October in Shanghai
  - Supposed to be held in person, will have to see what will be travel situation to see if we can participate, otherwise will connect remotely
- FCCs Kickoff meeting at Cern on November 9th

Conference Opportunities in 2021

- In 2019 huge number of talks at conference and workshops offered to FCC-ee and CEPC collaborators
  - Many of these had to be given by just a few people
    - Would have been good to distribute them more...
    - This year is very special, but in 2021 we can expect an even larger number (wrt. 2019) of talks as the EPSSU has indicated FCC as 1st priority
    - Both large conferences, like LHCP (Paris), EPS (Hamburg), Lepton Photon (Manchester), as well as many more smaller ones
    - A lot of workshops...

So don't be shy, there is place for everybody to give talks. Many opportunities for young collaborators

Preventivi RD-FCC 2021

- Anagrafica
  - Ricercatori
  - Tecnici
    - Richiesto 50% di un elettronico
    - 2 m.u. di una persona STG (Gessi) per aiutare a realizzare il sistema di trigger per il cosmic ray telescope
- Richieste finanziarie
  - Missioni
  - Materiale