

CepC – International collaboration

Outline

- ❖ Some history
- ❖ CepC
 - IDEA
 - Workshops
- ❖ Common software infrastructure
- ❖ EU grants
- ❖ Next steps

F. Bedeschi,

CepC workshop

Chicago, September 2019

CepC International collaborations

❖ Accelerator

- USA, Russia, Italy, Japan,

❖ Detector & Physics

- Italy: various detectors, software
- Serbia: luminometer
- Spain: Pixel detectors
- UK: Silicon based detectors
- France: TPC (LCTPC coll.), PF calorimeter (CALICE)
- Japan: PF calorimeter (CALICE)
- USA: pixels, full Si tracker, crystal calorimeter?

❖ This talk will describe the Italian experience

❖ INFN-China collaboration intensified during this decade

- INFN participation in several experiments in China
 - BES-III at Beijing e+e- accelerator
 - JUNO reactor ν experiment
 - HERD Cosmic ray experiment on the Chinese space station
 - DAMPE High energy γ Chinese satellite experiment
- Cooperation on future accelerators
 - CEPC (and other ones)
- Cooperation on future accelerator technologies
 - Muon collider
 - Plasma acceleration
- Annual cooperative meetings INFN-IHEP since 2012
- Formal cooperation agreements to help exchange of people

Meanwhile INFN in 2013-16

❖ INFN-CSN1 prepares white paper

- 2 yr process involving ~900 physicists
- Published results in 2015
- A future circular e+e- Higgs factory was preferred by most contributors, but
- CERN was leaning toward FCC-hh

❖ 2nd FCC week in Rome 2016

- Contacted Yifang on CepC
- Visits to China followed

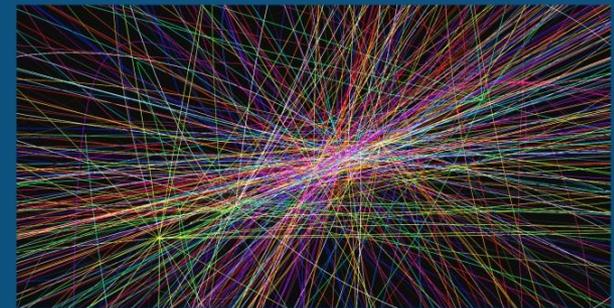
❖ INFN supported generic R&D for future (any) accelerators



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What Next: White Paper of CSN1

Proposal for a long term strategy for accelerator based experiments

Frascati Phys. Ser. 60 (2015) pp. 1-291

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Editors

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❖ Italian contributions to CDR

- Accelerator (not covered here)
 - ILC/X-FEL & DAFNE e+e- experience

- Detector

- Think how to go beyond ILC inspired detectors
→ IDEA detector concept

- Support new technologies with strong Italian contributions

- New generation pixel detectors (ARCADIA)
- New generation drift chamber with cluster counting for PID
- Low mass thin coil
- Dual Readout calorimeters
- Innovative MPGD tracking technology (μ Rwell) for preshower and muon detector



IDEA = Innovative Detector for Electron-positron Accelerator

CepC vs FCCee

❖ CERN priorities have (maybe) changed

- If FCC goes ahead, FCCee would go first

❖ Italy is a full member of CERN

- If FCCee becomes the priority than it will also be for INFN

❖ However!

- Until FCCee is decided and funded it is quite reasonable to collaborate with both FCC and CepC!
 - The two machine are very similar and therefore also the detectors

❖ Additional advantage

- Facilitate interaction between the FCC and CepC communities
 - See later on software stack
- In the end want all resources possible in the chosen site

❖ Help widen International reach/Improve relation with FCC

- First CepC workshop outside of China in Rome, May 2018
- Over 100 participants – 40% Chinese



**Workshop on the Circular Electron-Positron Collider,
EU Edition 2019**

15 April - 17 April 2019, Oxford, UK

Software Infrastructure

- ❖ Collaboration between several e+e- communities essential!
 - ILC/CLIC/FCC/CepC

- ❖ Common software infrastructure is critical
 - Software workshop in Bologna, Italy in June 2019
 - All communities represented there including a US person (D. Lange)
 - Good start towards common software stack
 - Hands on workshop on FCC SW at CERN 2-3 Oct., 2019
 - <https://indico.cern.ch/event/839794/>

❖ Grants involving China, INFN and other EU institutions

- FEST (approved)
 - Support for travel of EU people to China
 - CEPC and BES-III are included
- AIDA++ (to be approved)
 - IHEP: Advanced Readout CMOS Architectures with Depleted Integrated sensor Arrays
 - USTC: Industrial engineering of high-rate μ RWELL detectors with bi-dimensional readout
 - IHEP: Software infrastructure for future colliders
- CREMLIN+ (approved)
 - Support for DCH R&D

Next steps

❖ Consolidate collaboration

- FEST is a great help to send young physicists to China for common developments for extended periods
 - Analysis and DAQ software could be a good start
- AIDA++/CREMLIN+ will provide funds for post-docs
- As work toward TDR progresses explore potential contributions from Chinese industry. This helps a lot to find collaborators
 - e.g DLC deposition, clear & scintillating fibers, SiPM, crystals,
 - Need better link between partner's needs and Chinese industry
- Common work on detectors is difficult, but we are trying to set it up with vertex detector prototyping and μ Rwell chambers
 - Clean project breakdown important

Next steps

❖ Organization very informal so far

- IB meets during international workshops
- No formal MoU from participants
 - Basic MoU under discussion
- No centralized coordination of international R&D yet
 - Detector group coordination just completed
 - Similar structure setup for accelerator work

❖ Formal agreements for CEPC should wait until ESPP2020 is finished

- Interaction with other international big projects will be clearer
 - In particular the direction that CERN will take
- No problem with specific sub-detector R&D
 - Applies to any collider

Conclusions

- ❖ Italy has a long experience of collaboration with China
- ❖ Common work on CepC has typical issues of projects not yet approved
 - People spend only a fraction of time on this
 - LHC upgrades are pressing and taking most of their time
 - They also take most of INFN resources
- ❖ Latest EU grants improve this situation
- ❖ Collaborating with both FCC and CepC is sometimes challenging, but has many advantages
- ❖ Interaction with the Chinese colleagues is excellent
 - After all we practiced since the time of Marco Polo