Status of International Collaboration for CEPC Detectors R&D

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Collaboration on Silicon Strip

- Intended contribution of ~1000 barrel strip modules for the *ATLAS Phase II ITk upgrade*

- **IHEP** established strong collaboration with **STFC-RAL**
  - Have started *staff rotation plan (2 FTE)* toward the end of module mass production \(\rightarrow 500\) modules with RAL’s support
  - Dedicated training for *wirebonding technician*
  - Financial contribution to *international fellowship*

  Group visit in September 2016 and meeting the UK ATLAS-ITk project management

**IHEP-RAL MoU** in preparation
Collaboration on Silicon Strip

- **Collaboration with DESY**
  - China and Germany Postdoctoral Exchange Program → 2 postdocs as main developers of EUDAQ and EU Telescope and provide technical support of EUDET beam telescopes
  - Student exchanges via the DESY summer student program

- **Collaboration with SLAC**
  - Joint R&D effort on CHESS 2 (HV-CMOS strip sensor), in particular on sensor characterization
  - Joint postdoctoral positions (topics of common interests)
Collaboration with IPHC, Strasbourg

- R&D on a pixelated tracker using CMOS pixel sensors (CPS)
  - a project originally aimed at the upgrade of BES3 inner drift chamber, building a 1/10 prototype
  - based on MIMOSA-28, chips used for STAR-PXL
  - investigating design of large-dimension pixels

Pixel response tested with $^{55}$Fe
Collaboration with IPHC, Strasbourg

- Electron collider oriented pixelated CMOS sensor development
  - aimed at the future CEPC and ILC colliders
  - exploit the potential of CPS technology
    - readout < 1 µs
    - pixel dimensions small enough to reach a spatial resolution < 3 µm
    - power consumption compatible with a low mass cooling system
  - tape-out in May 2017 with digital pixels

11/8/2017
LC-TPC international collaboration group (LCTPC)

- Signed MOA and joined in LC-TPC collaboration @ Dec. 14, 2016
- As coordinator in ions test and the new module design work package
- Regular meeting bi-weeks
- Plan to beam test in DESY with our TPC prototype with 266nm laser calibration and the hybrid gaseous detector in 2018
Collaboration of LC-TPC R&D

- **CEA-Saclay IRFU group (FCPPL)**
  - Three video meetings with Prof. Aleksan Roy/ Prof. Yuanning/ Manqi and some related persons (2016~2017)
  - Exchange PhD students: Haiyun Wang participates Saclay’s R&D six months in 2017~2018
  - Bulk-Micromegas detector assembled and IBF test
  - Optimized designed Micromegas module with more 590 LPI

- **LC-TPC collaboration Japan group (KEK)**
  - Joint dE/dx analysis of the beam test data@2016
  - Regular meeting every week
  - Optimized designed wider hole GEM module with 90-70-90
Collaboration of LC-TPC R&D

Collaboration with CEA-Saclay

- Joint meeting with Saclaty/THU/IHEP
- Design the Micromegas PCB boards
- Prepare to assemble the R/Micromegas

Collaboration with KEK/DESY

- GEM module with gate GEM in 1.0 Tesla
- 5.0Gev electron beam test
- Join in group and participate in analysis
Join the CALICE Collaboration

- THU and SJTU joined the CALICE Collaboration
- Collaborating with Imad Laktineh (IPNL) on SDHCAL R&D.
- We have a joint Ph.D student via CSC program (2 years). CAN-059 about using BDT to improve pi/e/mu separation is under review process.
- SJTU will host the CALICE collaboration meeting on Sept. 19-21, 2018. https://agenda.linearcollider.org/event/7799/

⇒ IHEP and USTC plan to join the CALICE to work on ScW ECAL and AHCAL

THU/SJTU/CALICE
Collaboration on Detector Design & Optimization

- PFA Oriented Reference Design (CEPC_v4): TPC/Si + High Granularity Calorimeter
  - Fully established at simulation, reconstruction and analysis
  - Geometry adapted to CEPC collider
  - Parameters optimized w.r.t Physics Objects
  - Domestic task force: IHEP + PKU + SJTU
  - Collaborations
    - LCTPC: feasibility study on TPC usage
    - CALICE: Calorimeter geometry optimization
    - ISU: TPC dEdx performance study
    - LLR, NTU, Chicago U, INPL, CERN: PFA reconstruction & Analysis
    - LBL, ANL: Si Tracker Simulation/Reconstruction

- Alternative Concept using wire Chamber + Dual readout
  - Conceptual detector implemented in Geant 4
  - Domestic task force: IHEP + NKU
  - Collaborations
    - RD52: Dual Readout Test beam & digitization study
    - INFN: Sub detector design
    - Kyungpook National University (KNU): Implementation of simulation
Some Suggestions

Fruitful discussions and suggestions:

- join existing workshop groups (e.g. ILC, FCC-ee)
- have joint group meetings on specific topics
- invite international colleagues to join CEPC working group
- work closely and be a part of detector R&D
- seek funding via joint proposal (e.g. IHEP/USTC - INFN)
- joint Ph.D students via CSC program
- joint postdoc to work on CEPC R&D
- ......