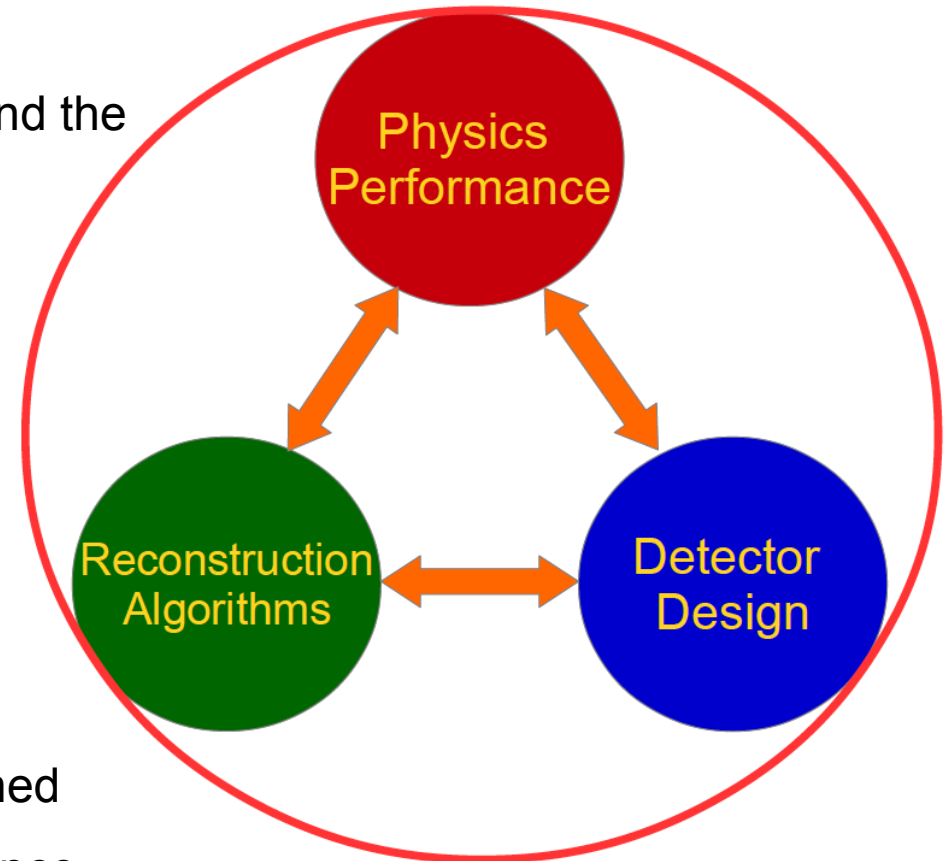


CEPC Physics Studies: Toward TDR

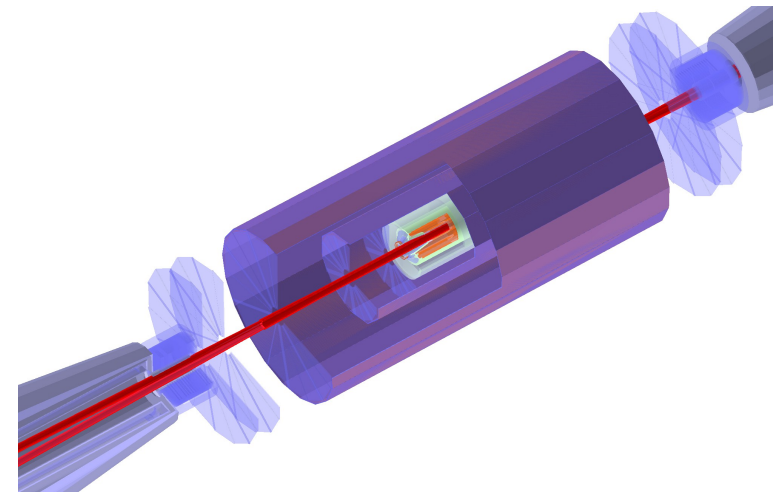
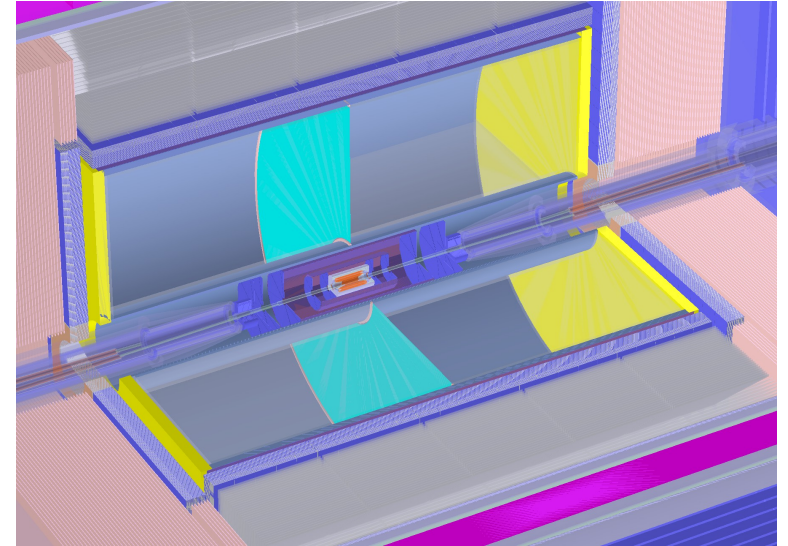
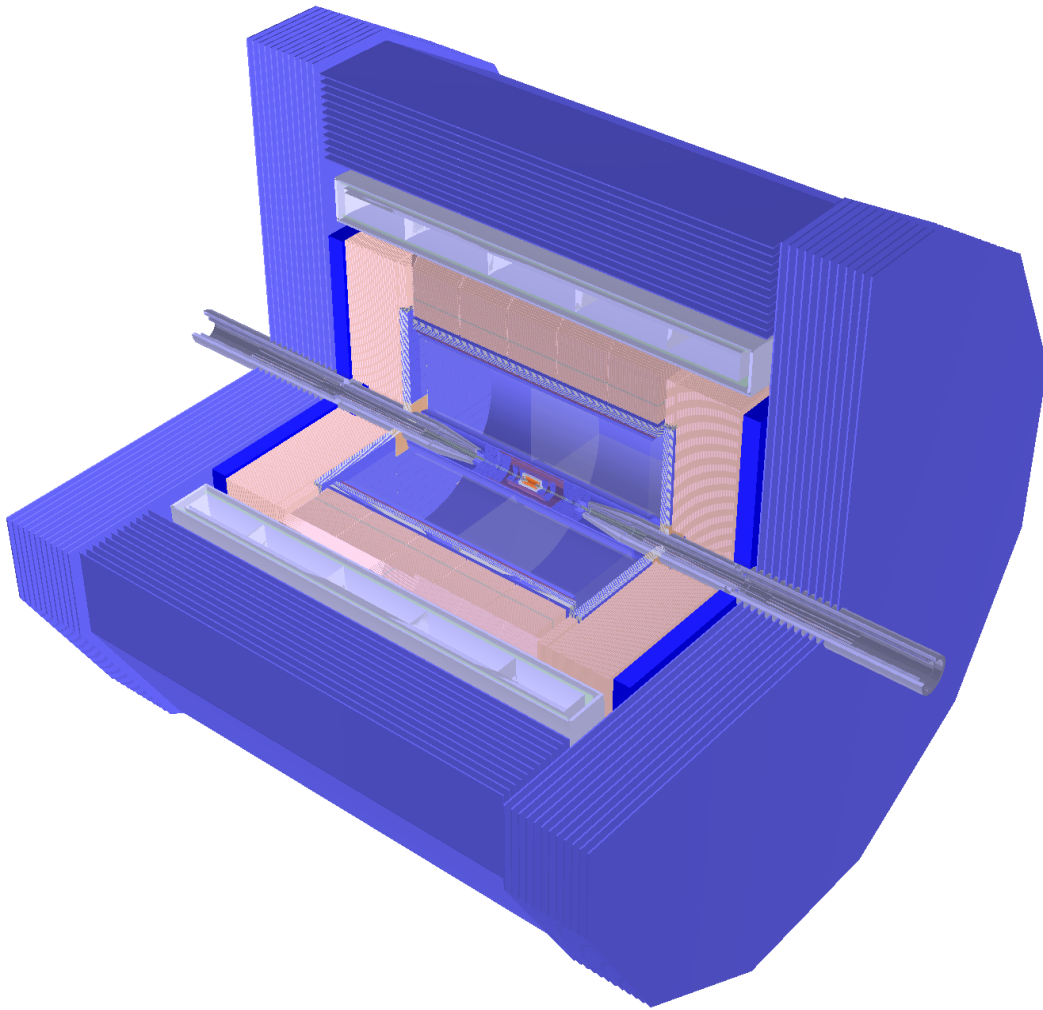
Manqi Ruan

Key objectives

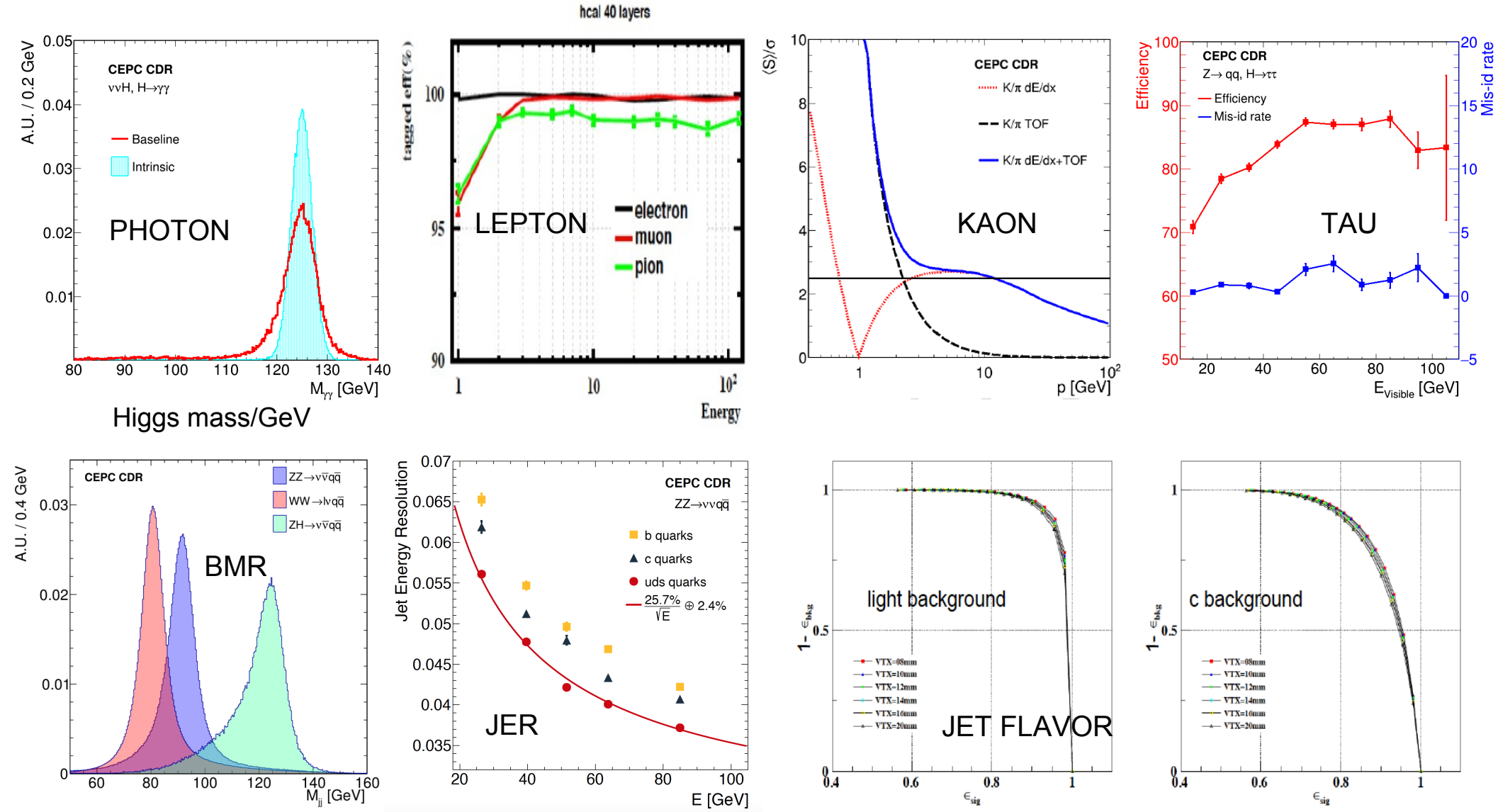
- To understand/quantify the Physics potential and the comparative advantages versus existing/other future facilities
- To deliver the software-reconstruction system and the analysis technology
- To deliver detector design(s), that
 - Fulfills the performance requirement
 - Mature & robust
 - Cost efficient
- In the CDR study:
 - The baseline geometry & software established
 - Profound analyses on the physics performance



APODIS Geometry



Physics Objects: Tamed



Feedbacks from the CDR review...

- Physics potential: Very solid performance study & Higgs Simulation
 - Better quantify physics reach at EW, Flavor and QCD programs
- Detector design: PFA baseline fulfills the requirements
 - Better quantify the requirement: Pid, MET, c-tagging, etc
 - Tensions on the TPC, Muon-Yoke...
 - Better balance between cost and performance
 - Innovative designs, integration (cooling, DAQ, mechanic)...
- Software: Decent PFA and tracking (Lepton, Tau, BMR & MET)
 - High-level objects need more study: Jet clustering, Flavor Tagging, ...
 - Long term: Framework, Parallel computing, ...

Post CDR Study

- Physics potential

- Better quantify physics reach at EW, Flavor and QCD programs

- Detector design

- Better quantify the requirement: Pid, MET, c-tagging, etc
- Tensions on the TPC, Muon-Yoke...
- Better balance between cost and performance
- Innovative designs, integration (cooling, DAQ, mechanic)...

- Software

- High-level objects need more study: Jet clustering, Flavor Tagging, ...
- Long term: Framework, Parallel computing, ...

The diagram consists of two ovals on the right: a light blue one at the top and a light green one at the bottom. On the left, there are three main bullet points: 'Physics potential', 'Detector design', and 'Software'. Each has sub-bullets. Arrows point from the sub-bullets to the ovals: 'Better quantify physics reach...' points to the blue oval; 'Better quantify the requirement...' points to the blue oval; 'Tensions on the TPC...' points to the green oval; 'Better balance between cost and performance' points to the green oval; 'Innovative designs, integration...' points to the green oval; 'High-level objects need more study...' points to the green oval; and 'Long term: Framework, Parallel computing, ...' points to the green oval. A dashed arrow also points from the 'Software' section to the blue oval.

White paper studies

Detector –
Software Study

White papers

Objectives

- Address the CDR feedbacks...
- Serve as:
 - Physics hand books for new students/PostDocs
 - Official references for the physics reach
 - Guideline for the detector design
 - *Analogy to LEP Yellow book & LHC Higgs Xsec reports...*
- **Be delivered by Sep. 2020**

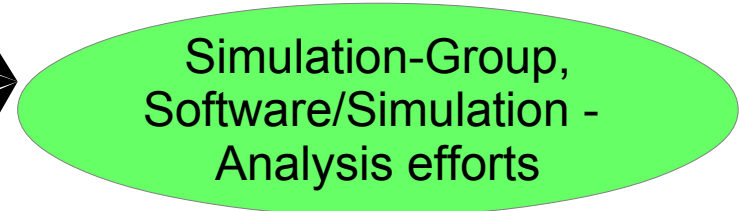
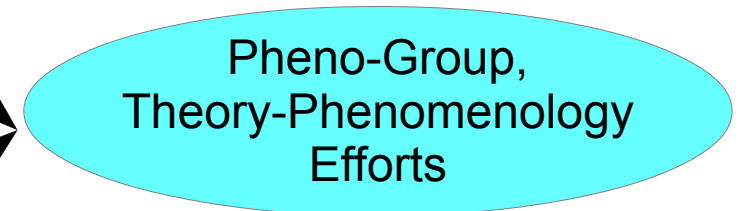
Content

- General description
 - Core physics knowledges
 - The physics landscape
- A few physics benchmarks
 - Simple
 - Clear physics meaning
 - Clear requirement on the detector performance
- Optional: Guideline for core analyses
- Interpretation and comparison
- Executive summary to the detector design

A White paper: Task sharing

- General description
 - Core physics knowledges (from the SM Lagrangian)
 - The physics landscape
- A few physics benchmarks
 - Simple
 - Clear physics meaning
 - Clear requirement on the detector performance
- Optional: Guideline for core physics measurements analysis
- Interpretation and comparison
- Key message to the detector design (executive)?

Ideally...
Each white paper should form
it's own working group



Pheno:
Provide valid generator samples for
Physics benchmark

Task of Editorial board

- Editorial board
 - Appointed contact person(s)
 - Control of the main content
 - Table of content
 - List of Benchmark channels
 - **Editing**: Ensure the quality and the schedule
 - Coordinate the collaborations
 - Identify/train needed manpower, especially for the analysis
 - Enhance/enlarge the collaboration (especially internationalization)
 - Organize the regular meeting and topical workshops
- *Benchmark analysis at full simulation level:*
 - *Relative expensive & time-consuming*
 - *Takes 8 month to 1 year to converge one analysis*
 - ***Need to start - now!***

Existing manpower

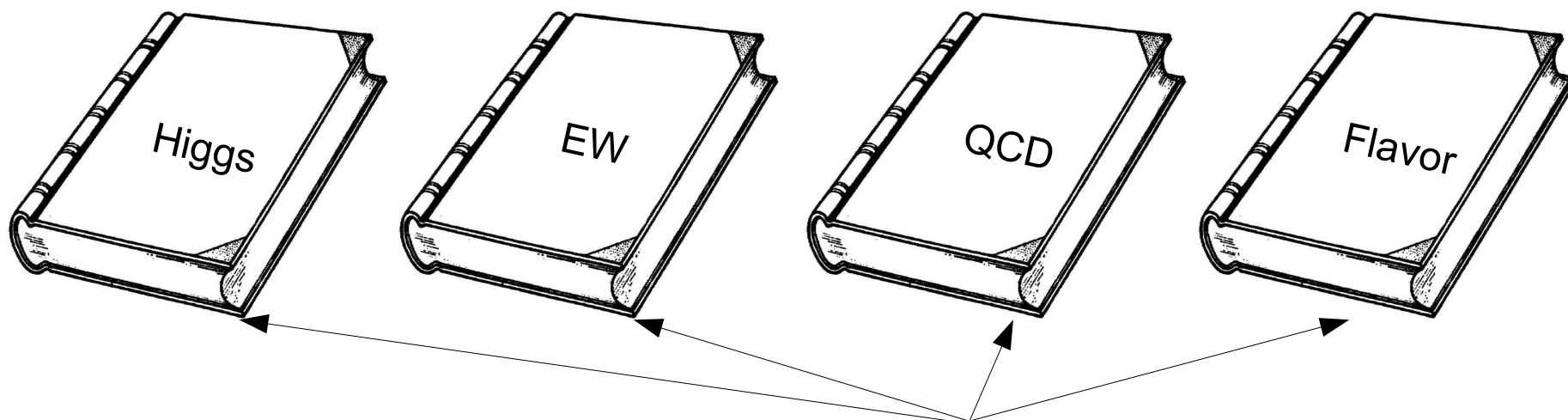
- Tentative white paper contacts
 - QCD: HuaXing Zhu
 - EW: Zhijun Liang
 - Flavor: Haibo Li
 - Higgs: Yaquan Fang
- Jianming: General support (the helper)
- Liantao: Physics-Interpretation effort
- Manqi: Central simulation effort

Existing manpower

- Tentative white paper contacts
 - QCD: HuaXing Zhu
 - EW: Zhijun Liang
 - Flavor: Haibo Li
 - Higgs: Yaquan Fang
- Jianming: General support (the helper)
- Liantao: Physics-Interpretation effort
- Manqi: Central simulation effort

You!

Central simulation group will help



- Input for the **benchmarks**
- Dedicated performance study
- Official MC samples
- Training for new analysts
- Analysis a few benchmark
- Feedback to detector
- Services: webpage, indico, mailing list, DocDB, Git.



Today we shall discuss

- For each white paper
 - Working group
 - Contact
 - Editorial board
 - Sim Group
 - Theory Group
 - Table of content
 - List of Benchmark analysis
 - Timeline
- We hope each group could soon provide
 - Name lists
 - Version-zero of ToC, Benchmark list & Timeline
 - Resource demand estimation: manpower
- A dedicated vidyo meeting will be held around **Dec 15th**.

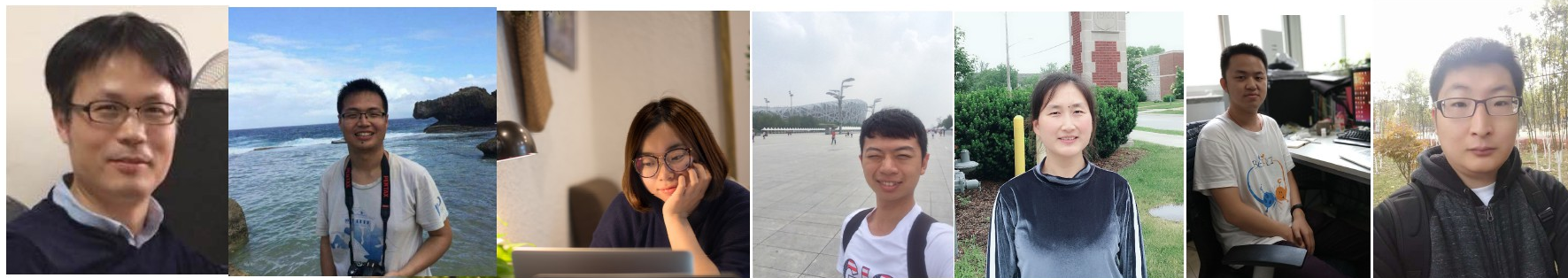
Communications

- Management oriented:
 - Monthly discussion between the white paper editorial boards
- Physics oriented:
 - Regular Intra group discussion
 - Topical workshops
- General: Face-to-face workshop every six months
- Inform discussion/coffee anytime

- Be open, be efficient, and on board anyone that has interests
- The next white paper general workshop, will be held in July 1st - 5th 2019, at Peking University (data might be adjusted – be finalized soon)

Backup

Central Simulation/Software Group



C. Fu, Geant 4
& Tracking

X. Zhao, Software
& production

Dan, Lepton ID,
Tau, PFA

P. Lai, Jet
Calibration

F. An, Pid &
Flavor

Z. Wu, VTX
Optimization

H. Liang,
Generator



Y. Shen,
Photon

M. Zhao,
Tracking,
TPC,

G. Li, Generator
& Flavor tagging

H. Zhao, Calo
Optimization & PFA

Y. Zhu, Jet
Clustering

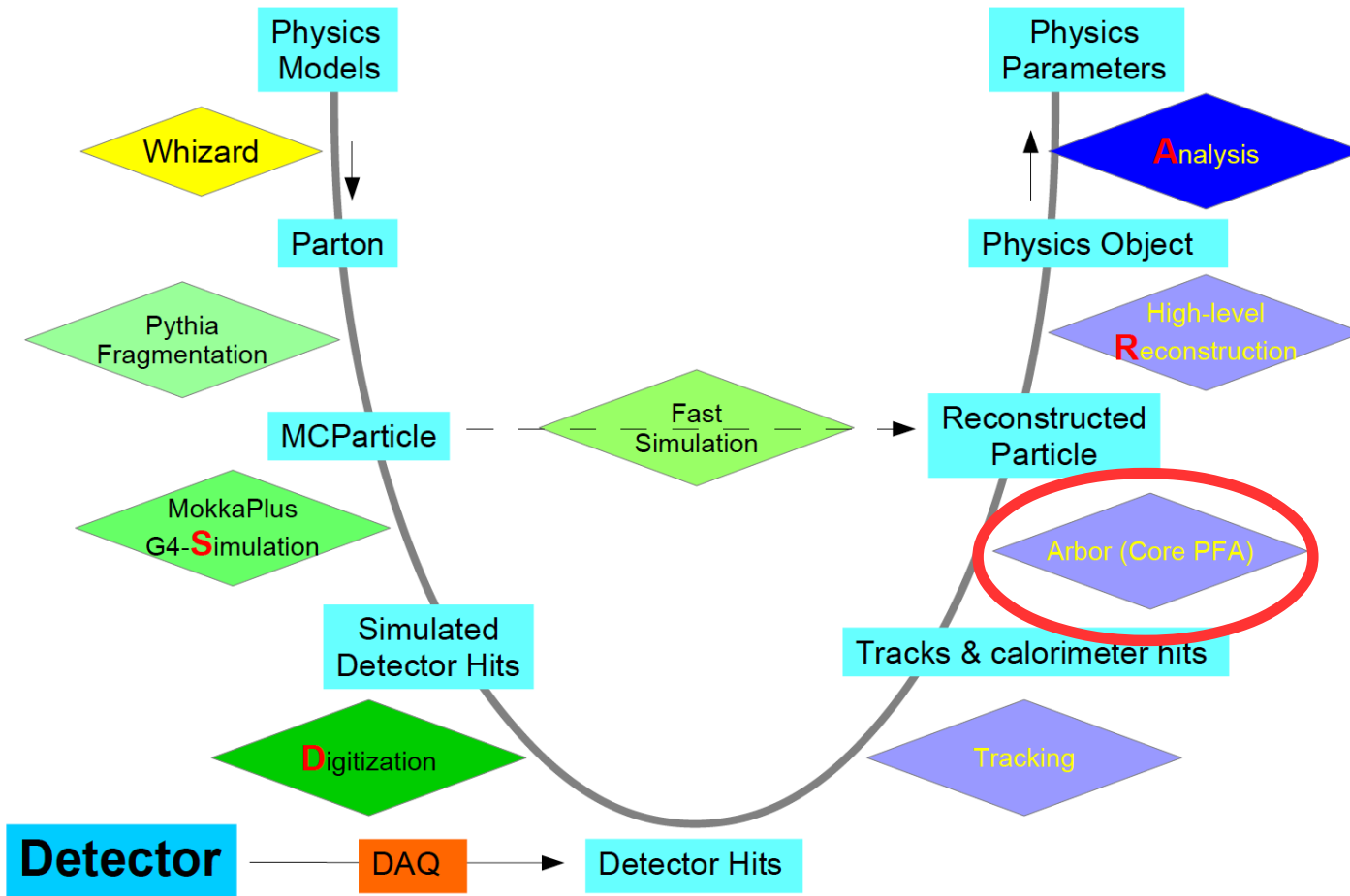
T. Zhen,
K_short &
Lambda

M. Ruan, PFA,
Object,...

Central simulation group plays a crucial role in the CDR/baseline design

Members are actively involved in physics analysis/detector optimization study

The Simu-Reco Chain at CEPC



Generators (Whizard & Pythia)
Data format & management (LCIO & Marlin)
Simulation (MokkaC)
Digitizations
Tracking
PFA (Arbor)
Single Particle Physics Objects Finder (LICH)
Composed object finder (Coral)
Tau finder
Jet Clustering (FastJet)
Jet Flavor Tagging (LCFIPLus)
Event Display (Druid)
General Analysis Framework (FSClasser)
Fast Simulation (Delphes + FSClasser)

CEPC-SIMU-2017-001,
CEPC-SIMU-2017-002,
(DocDB id-167, 168, 173)

General Software

ILCSoft

ILCSoft +
Development

Developments