CDR Discussion
How much time we have

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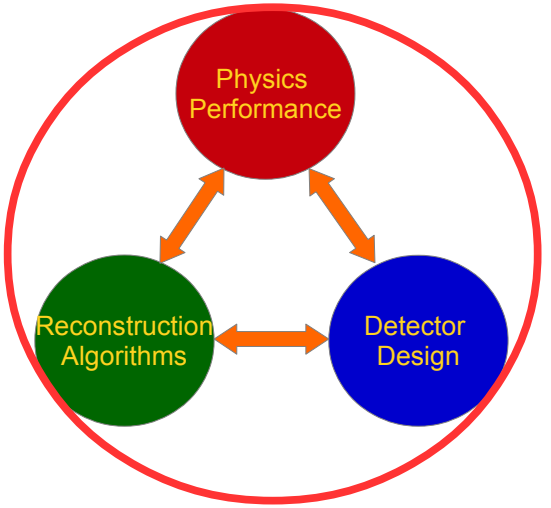
Tasks ahead

- Detector Geometry Design
  - ILD-like:
    - Key parameter selections
    - Key performance
    - Key questions (Potentially No-Go)
  - Significant Beyond ILD: any good idea?
  - Systematic errors...



- Software Chain: A continuous effort of 3-5 years.
- Physics Potential
  - Higgs — Mostly done. Benchmarks need be iterated at new geometry
  - EW, Z — ??
  - Flavor, — ??
  - ... theoretical errors — Progressing

CDR Content

- Physics & Detector
- Physics Side
  - Benchmark detector geometry & Benchmark performances
    - Validation/Specification of these geometries
  - Higgs Physics
    - Accuracy at CEPC_v1 Mostly done
    - Extrapolation to New Benchmark Geometry?
  - EW Performance
    - With at least 1 channel covered by full simulation

- *Detector Side: Try to help in answering potentially No-Go questions for sub-detector design*

Physics Benchmarks

Benchmarks	Main observables	Key performances	Status
llH, H->X	Higgs recoil spectrum	Lepton Id efficiency, Tracker intrinsic momentum resolution	Well understood
H+X, H->di photon	Event reconstruction efficiency, Higgs invariant mass peak width	Tracker Material, Intrinsic ECAL energy Resolution	
ZH->4 jets,	Br(H->bb, cc, gg)	Jet clustering, PFA: Jet Energy Resolution, Jet Flavor Tagging	Studied at CEPC conceptual Detector (CEPC_v1)
vvH, H->di tau	Efficiency of Tau reconstruction with different tau decay mode	PFA separation, Impact parameter resolution	
qqH, H->invisible	Higgs recoil spectrum	PFA: Jet Energy Resolution	
vvH, H->WW->lvqq	Event Reconstruction Efficiency di-jet mass distribution	PFA, Simultaneous reconstruction of Lepton, Jets and Missing Energy	Studied at different Calorimeter Granularity
H+X, H->di muon	Event reconstruction efficiency, Higgs invariant mass peak width	Lepton Id efficiency, Tracker intrinsic momentum resolution	Studied at CEPC conceptual Detector
vvH, H->2 jets	Br(H->bb, cc, gg)	Jet Energy Resolution & Flavor Tagging	
WW->lvqq	W mass	Jet Energy resolution & Systematic controls	Full simulation analysis not accomplished yet

Each analysis will be repeated at different geometry, with full Higgs signal sample (and potentially WW sample)

Fix Basic Geometry

- Benchmark detector geometry
  - ECAL Layout — Done
  - HCAL Layout — ~ 2 months
  - Tracker Size
    - for tracking performance — Done
    - PFA Performance — ~ 2.5 months
  - B-Field Strength — ~ 1 months
  - Integrated with a reliable MDI — ???

- ~ half a year is needed to fix the basic geometry of the detector, with a full support from the analysis team.
- Very unfortunate, many key players will leave us soon

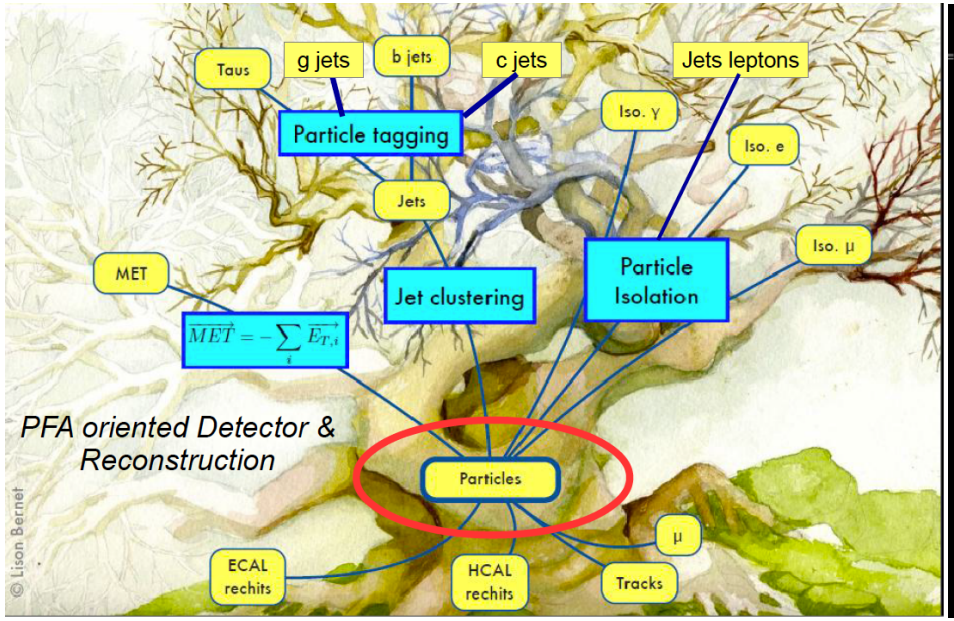
Summary

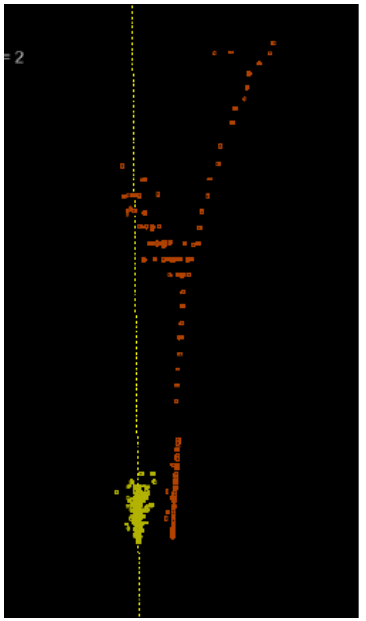
- Core Content Could be secured
  - Para. Opti. w.r.t. ILD
  - Key performance & answer to key questions
  - Need to have enough skillful manpower in analysis team (even!)

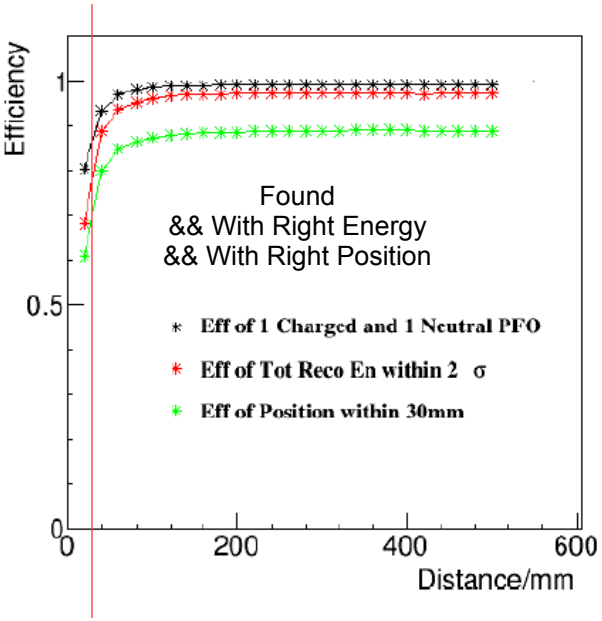
- My personal P.o.V: not very likely that we will converge at something significantly beyond ILD (esp. In 2 years...)
  - But would be good to give arguments, either opposite. Or support ILD

- Long term activities, including software development, should be put in operation now.

Detector performance







Acceptance	$\lvert\cos(\theta)\rvert < 0.995$ (from the inner radius of the outmost tracking disk)
Tracking Efficiency	For isolated charged particle with energy > 1GeV：~100%
Photon Reconstruction Efficiency	For isolated photon with energy > 0.5 GeV：~100%
Tracker resolution	$\delta(1/P_T) = 2*10^{-5}(\mathrm{GeV}^{-1})$
ECAL intrinsic resolution	$\delta E/E = 16\%/\sqrt{E/GeV} \oplus 0.5\,\%$
HCAL intrinsic resolution	$\delta E/E = 60\%/\sqrt{E/GeV} \oplus 1\,\%$
Jet energy resolution	$\delta E/E = 4\%$
Typical Distance for shower separation	< 3 cm
Lepton identification	For charged particle with Energy >2GeV: Lepton identification efficiency > 99.5%, P(hadron→muon)~P(hadron→electron): 1%
b-tagging	At Z pole samples & eff(b→b)) = 80%，P(uds→b) < 1%, P(c→b) ~ 10%
c-tagging	At Z pole samples & eff(c→c)) = 60%，P(uds→c) = 7%, P(b→c) = 12%

Performance at full reconstruction

Benchmark separation distance < 3 cm (Testing on 10 GeV Pion + 5 GeV Photon Sample)