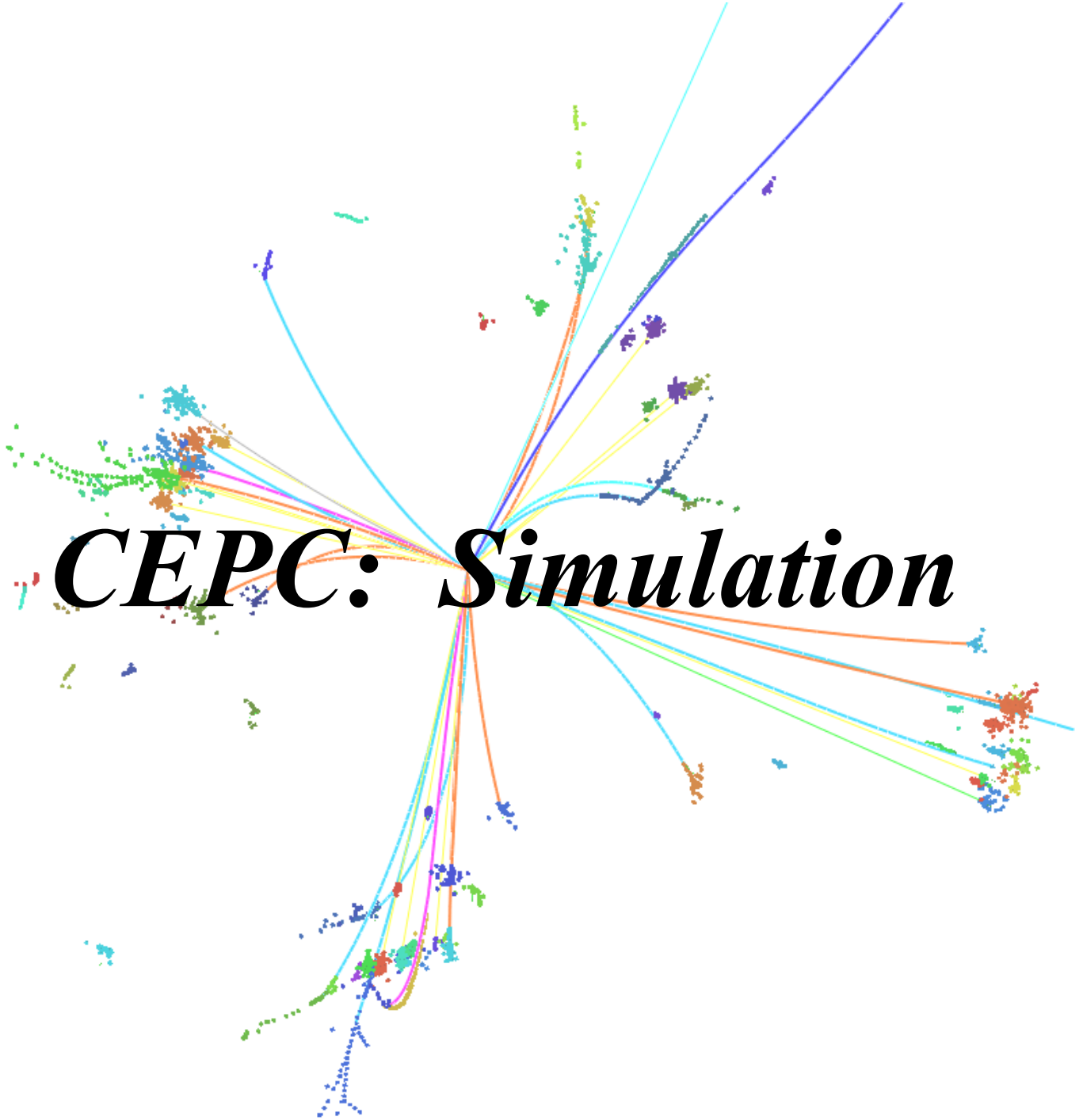


CEPC: Simulation

Status

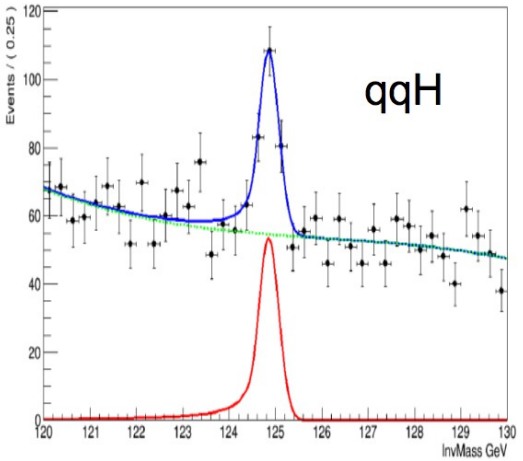
- Simulation:
  - Higgs simulation well covered.
  - EW Studies initiated & in bad need of experienced analyzers
- Reconstruction:
  - Huge progresses had been made toward PFA, Lepton ID, Jet Cluster, Track finding, etc.
- Detector optimization
  - PFA Oriented Detector:
    - Studied with full simulation – reconstruction & analysis
    - MDI Established, incorporate with 3 Tesla main solenoid
    - Feasibility study of TPC, Passive cooling calorimeters give green light
  - Dual-Readout Oriented Detector
    - To be implemented into full simulation

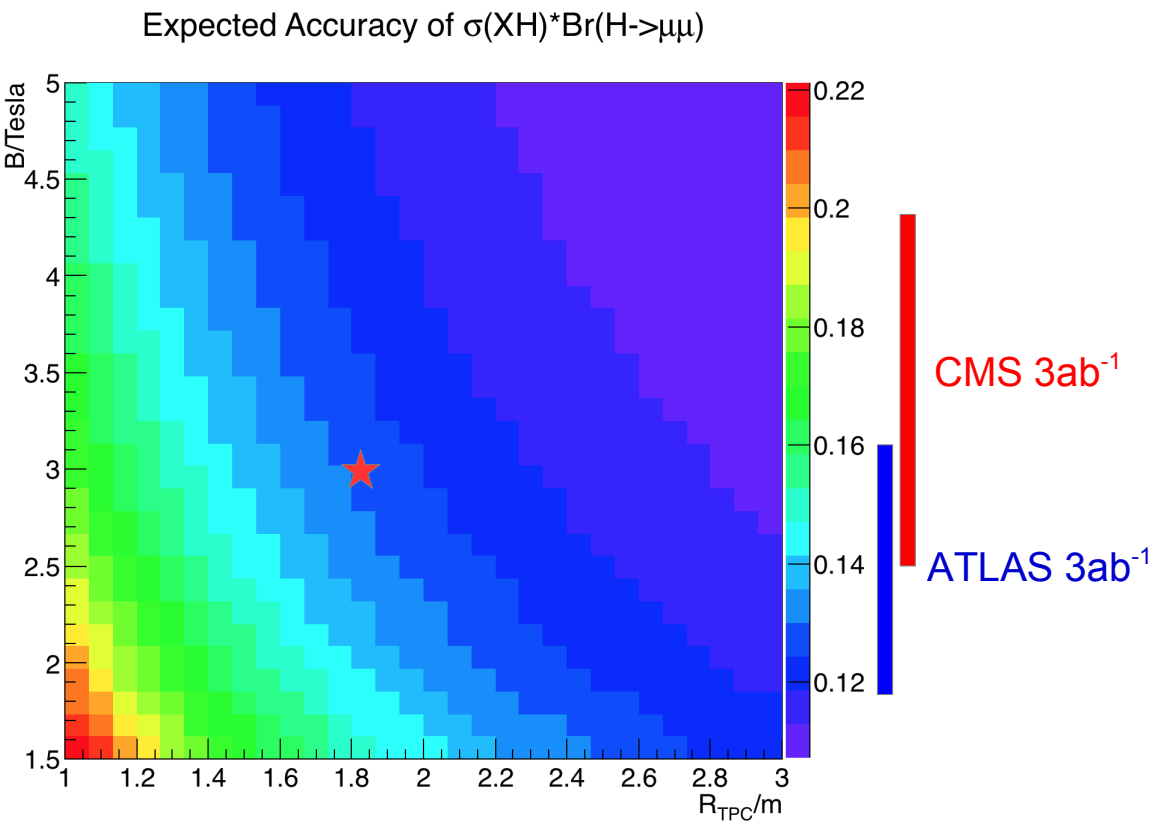
Optimized Parameters for PFA Oriented concept

	CEPC_v1 (~ ILD)	Optimized (Preliminary)	Comments
Track Radius	1.8 m	>= 1.8 m	Requested by Br(H->di muon) measurement
B Field	**3.5 T**	**3 T**	**Requested by MDI**
ToF	**-**	**50 ps**	**Requested by pi-Kaon separation at Z pole**
ECAL Thickness	84 mm	84(90) mm	84 mm is optimized on Br(H->di photon) at 250 GeV; 90mm for bhabha event at 350 GeV
ECAL Cell Size	5 mm	10 – 20 mm	Passive cooling request ~ 20 mm. 10 mm should be highly appreciated for EW measurements – need further evaluation
ECAL NLayer	30	20 – 30	Depends on the Silicon Sensor thickness
HCAL Thickness	**1.3 m**	**1 m**	-
HCAL NLayer	**48**	**40**	Optimized on Higgs event at 250 GeV; Margin might be reserved for 350 GeV.

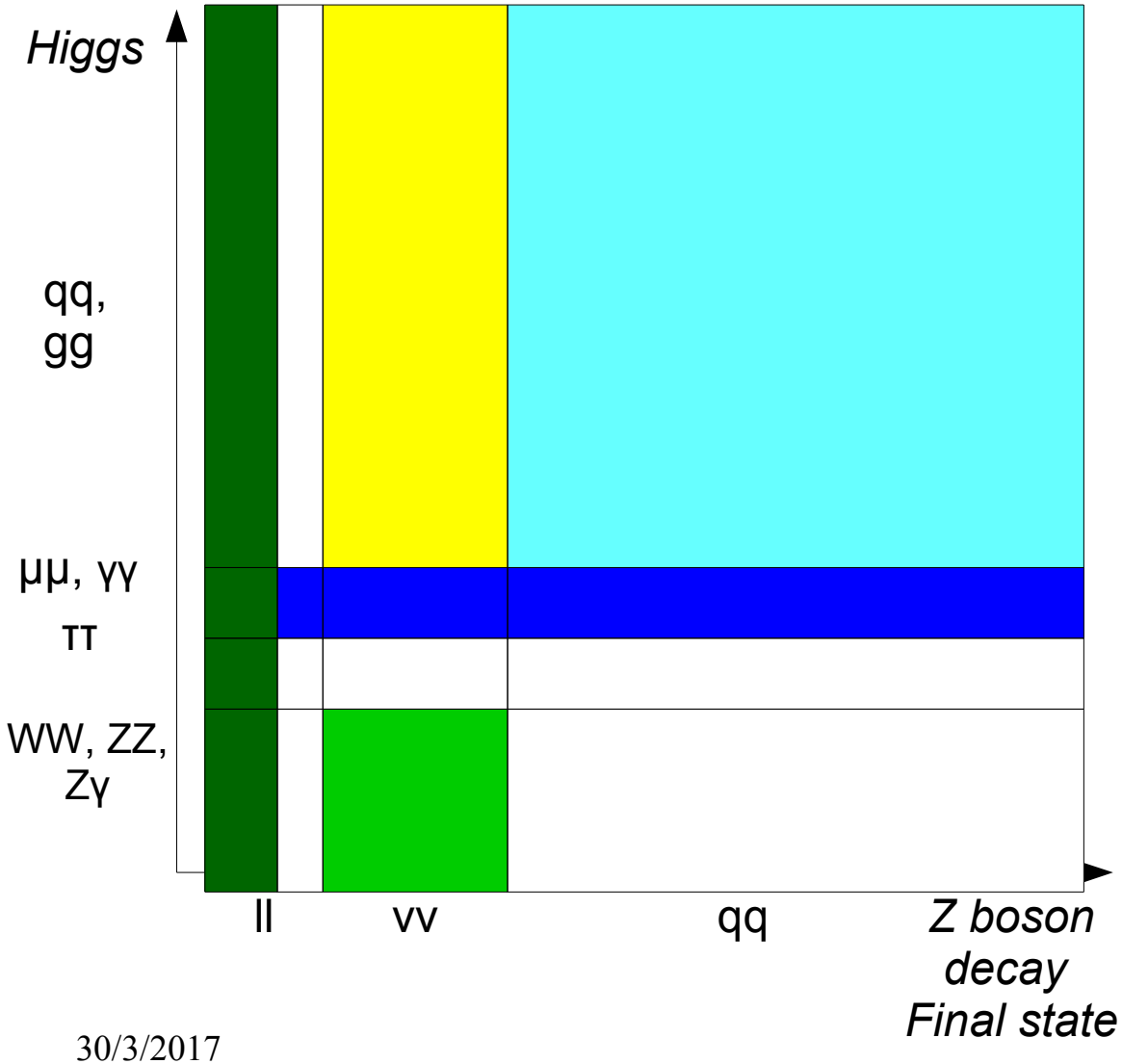
Tracker Radius optimization

- Detector cost is sensitive to tracker radius, however, I recommend TPC radius >= 1.8m, to ensure momentum resolution (delta(1/Pt) < 2E-5 GeV-1)
  - Better separation & JER
  - Better dEdx
  - **Better (H->di muon) measurement**





Benchmark measurements



Lepton & Momentum resolution: Br = 6.7%

Flavor Tagging & JER: Br = 14%

Composition of Jet/MET, lepton: Br = 4%

Jet Clustering: Br = 50%

Photon/ECAL: Br = 0.2%
Muon/Track: Br = 0.03%

qqH, H->inv. MET & NP: SM Br = 0.1%

EW, Br(tau->X) @ Z pole: Separation

Benchmark, key performance, level of understanding & key questions

Higgs recoil	Lepton & Momentum resolution: Br = 6.7%	95%	Performance at different R&B, Lepton id at different Geometry
Br(H->bb, cc, gg) via vvH	Flavor Tagging & JER: Br = 14%	40%	Performance Vs JER Vs Geometry
Br(H->WW->lvqq) via llH/vvH	Composition of Jet/MET, lepton: Br = 4%	60%	Reco. Efficiency at different Geometry
Br(H->bb, cc, gg) via qqH	Jet Clustering: Br = 50%	20%	The performance at MCTruth, Perfect & Realistic PFA
Br(H->di photon) via qqH Br(H->di muon) via qqH	Photon/ECAL: Br = 0.2% Track/Tracker: Br = 0.03%	90%	Isolation & Performance at Different resolution
Uplimit of H->inv via qqH	qqH, H->inv. MET & NP: SM Br = 0.1%	10%	Performance Vs JER Vs Geometry
EW, Br(tau->X) @ Z pole: Separation	Separation	10%	Performance Vs Geometry; Hardcore systematics

Level of Understanding/
Matureness of the analysis