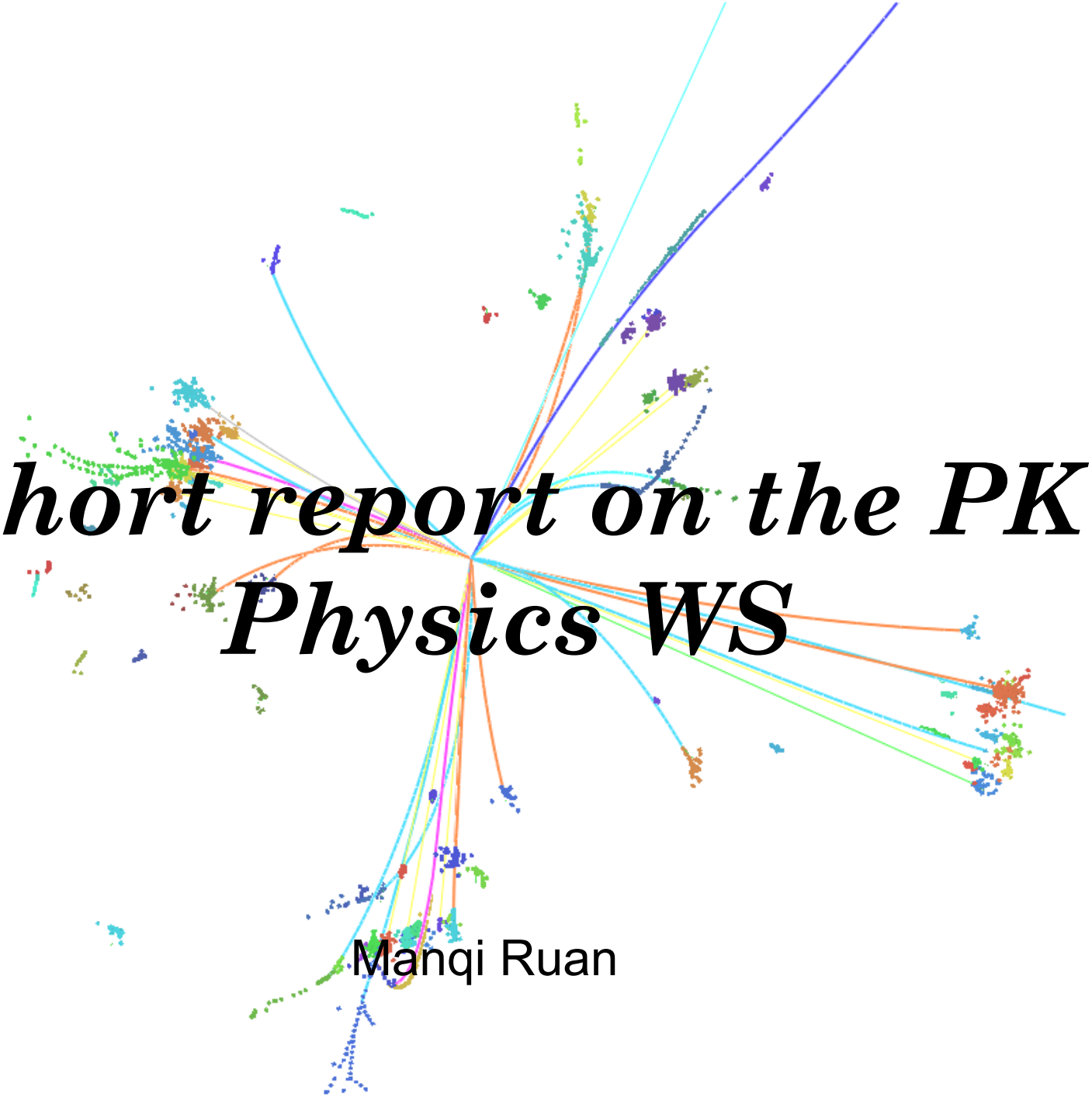


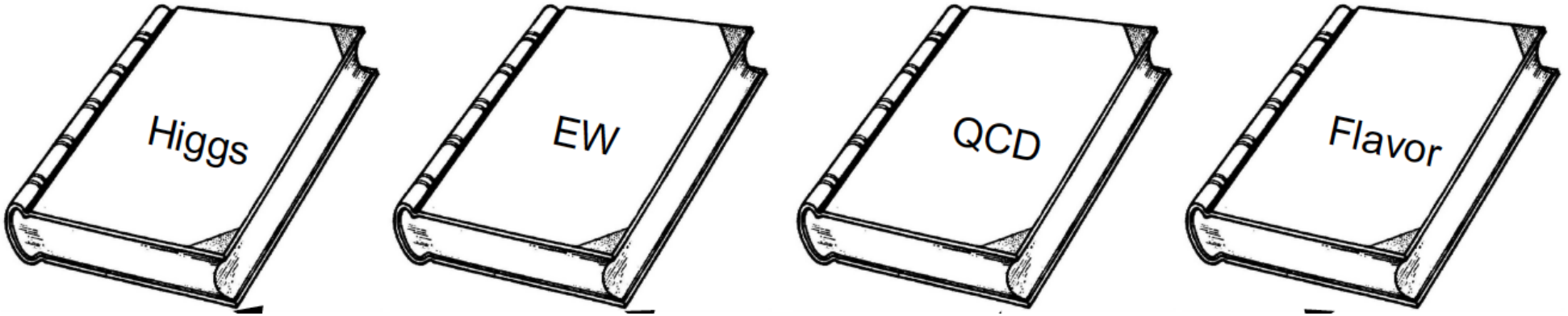
# *A short report on the PKU Physics WS*

Manqi Ruan


75 registrant + several visitors; ~ 50 talks. Covers Physics, Pheno, and Performance studies

Supported by IHEP CFHEP & PKU

# Objectives of this workshop




- To promote the physics study at TDR & to converge to the Physics White Papers by the end of 2020
- Physics white papers:
  - Physics handbooks for new comers: PostDoc/Student
  - Official references for the physics potential
  - Guideline for future detector design/optimization

# Boundary condition

- Limited Manpower
- Tight time schedule
- Vast topics landscape

- Pathway - Benchmarks, if possible flagship benchmarks
  - Reliable modeling of the detector response, background - quantify the detector requirement
  - Clear physics meaning & impact
  - If possible: simple

# Higgs

- Currently best understood

- Differential, CP
- Multi-jet final states analysis
- Control of theoretical uncertainty

# EW

- Systematic controls
  - Estimation & modeling
  - Requirement on the stability of performance...
  - Requirement on the beam energy calibration & monitoring

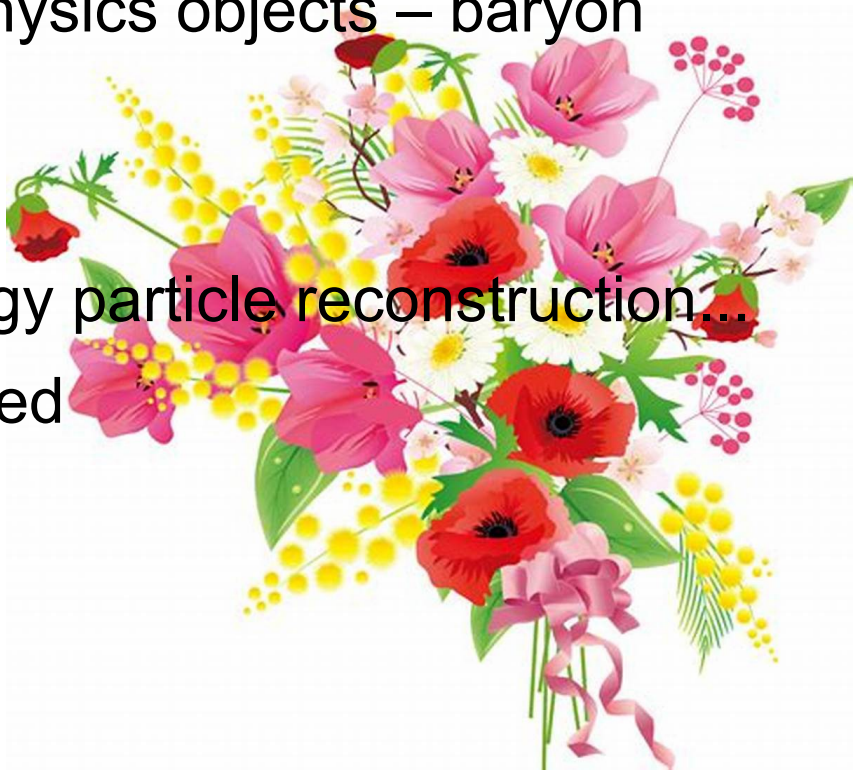
- + Higgs: EFT

# QCD

- alpha_s, and certainly a lot more than it
- Theoretical uncertainty control: major sources for many of EM measurement
- QCD Vacuum, correlations: many interesting topics by itself

# Flavor

- Very rich physics, but also have very demanding requirements – as LHCb and B/C factories certainly are very successful experiments!
- Performance: identification of the physics objects – baryon decay products in the jet
- Requirements:
  - May emphasize on the low energy particle reconstruction...
  - Separation is certainly appreciated



# Flavor

- Many Thanks to Haibo, etc: got strong international participation and lots of ideas
  - Sebastian Descotes-Genon: B->tau physics
  - Marek Karliner: Pc, 4/5 quark states, ISR return
  - Lorenzo Calibbi & Haibo: Tau exotic decays
  - Abi Soffer: semileptonic b-decay and CP violation
  - Wenbing: CP measurement via J/psiphi
  - Yu-Kuo: Baryonic B-decay...

# Performance study - Higgs

- Color singlet identification: Jet Clustering-Matching, or its alternative
- Differential: Jet clustering, and angular/energy measurement (Peizhu's talk)
- Global Fitting? (Gang)
- Requirement
  - JER & Kinematic Fit's impact
  - Tracking resolution – H->mumu measurement
  - VTX: flavor tagging, secondary vertex – impact parameter reconstruction

# Flavor benchmark: Constrains

- Cascading – significantly control the combination background
- Neutral particle in final states: eta, pi0, photon;
- Hopefully scientifically important:
  - CP
  - Tau physics
  - Particle search

- See Sebastien, Lorenzo, Abi, Marek's talk

# QCD benchmark

- Separation of events with different number of jets
- Development of color-singlet identification algorithms and study the best suited jet clustering for differential measurement?
- Alpha_s measurement:
  - The comparative advantage of CEPC
  - Different methods & comparisons
- Low energy object reconstruction... (QCD vacuum)
- Analysis of the fragmentation behaviors??

# EW

- Systematic controls: Performance calibration and controls

- Global interpretation:
  - + Higgs observables,
  - EFT framework and alternatives?

- TGC & Z->4 lepton channels, etc
- Impact analysis on beam polarization?
- Very nice talk from Yusheng, on ATLAS EW measurement

# Summary

- Progress to white papers: not bad
- Lots of discussion and interesting ideas proposed – live discussions continues
- Many interesting benchmarks emerge – need more manpower, especially on Flavor
- Performance studies links closer the detector & performance: on the Flavor/QCD side

- Next WS: Jan 13-15, Hongkong IAS
- EW: iterations also with ICFA input group.

# Many Thanks

# Many synergies in between

- Higgs + EW: global EFT interpretation
- QCD to Higgs +
  - Hoping a new Jet Clustering - Matching algorithm?
  - Systematic control
- QCD and Flavor
  - Demanding on the low energy particle reconstruction...