

## CEPC Physics and Detector Plenary Meeting

Time: Wednesday, December 4, 2019 from 15:00 to 17:00 (Asia/Shanghai)

Location: IHEP ( A419 )

Attending: Joao Guimaraes da Costa, Mingyi Dong, Manqi Ruan, Yiwei Wang, Yong Liu, Qun Ouyang, Gang Li, Yaquan Fang, Zhijun Liang, Shuiting Xin, Zhaoru Zhang (Minutes)

Vidyo: Cen Zhang, Franco Bedeschi, Has Zhang, Meng Wang, Paolo Giacomelli, Huirong Qi, Suen Hou, Jianchun Wang, Xin Shi, Yanyan Gao, Kaili Zhang, Hongbo Zhu, Jianbei Liu, Zhen-An Liu

### 1. Brief introduction from Joao

1) Joao update the organization progress of Hong Kong conference and related workshop

2) Other coming conference

a. CEPC Workshop EU Edition, 4-6 May 2020, Marseille • <https://indico.in2p3.fr/event/20053/>

b. 2nd USA Workshop in Washington, DC - April 22-23 • <https://indico.cern.ch/event/863751/>

c. Next CEPC DAY: Dec. 30th (Monday): will focus on tracking detector and MDI background study

3) Main topic for today's meeting: Request from IAC to consider top threshold running at CEPC. Accelerator project is asking to evaluate the scientific benefits of such run, for example, what energies are preferred?

Based on this request, we gave 4 talks to discuss the Higgs physics, Top mass measurement and new physics at star run.

### 2. CEPC collider design and challenges at tt bar energy, reported by Yiwei Wang

Yiwei calculated the luminosity based on different collision energy and power for TTbar running :

If 30MW

$0.38 \times 10^{34} \text{cm}^{-2} \text{s}^{-1} @ 350 \text{GeV}$

$0.32 \times 10^{34} \text{cm}^{-2} \text{s}^{-1} @ 365 \text{GeV}$

If 50MW

$0.63 \times 10^{34} \text{cm}^{-2} \text{s}^{-1} @ 350 \text{GeV}$

$0.53 \times 10^{34} \text{cm}^{-2} \text{s}^{-1} @ 365 \text{GeV}$

Yiwei mentioned that CEPC is optimized at Higgs energy, so the  $t\bar{t}$  running will be based on the hardware for Higgs except adding RF cavities. Since now  $T\bar{T}$  doesn't require high luminosity, no much change on the collider design and accelerator physics design. If physics group needs higher luminosity, accelerator group can change the design.

Two issues of the physics and detector people may concern:

- a asymmetric momentum acceptance in order to match the distribution with beamstrahlung.
- In the interaction region, the critical energy of radiated photon will be 3.5 times but the power will be a bit lower.

Comments:

Q: Why luminosity for  $T\bar{T}$  is lower than FCC? How to increase the luminosity?

A: In order to increase the luminosity, we need the new design for quadrupoles

Q: So how much time for adding the new RF cavity?

A: Not sure for now. Yiwei needs to calculate afterward. But Higgs running needs 346 RF cavities, and  $T\bar{T}$  needs another 400.

### 3. Higgs at $T\bar{T}$ energy run, reported by Kaili Zhang

Kaili reviewed the Fcc-ee study on  $T\bar{T}$  threshold scan and 365GeV run. He also gave the CEPC current estimation on Higgs extrapolation and top decays.

As the conclusion, for Higgs, CEPC needs a 350~365GeV run for  $v\bar{v}H$  to constrain Higgs width, because 2 different energy points would help for width and also triple Higgs coupling and so on.

Comments: Joao said that we should discuss  $T\bar{T}$  running energy only based on physics requirement. Everyone thought that 360 or 365 GeV may not have much difference on the results, the increase of luminosity may have more effect, but we should compare the performance for different energy to decide the best value.

### 4. Top mass measurement, reported by Zhijun Liang

Zhijun studied the top mass measurement for CEPC. Based on the theoretical calculation, he suggested the top threshold scan strategy as:

Possible target for top mass precision (15MeV) for CEPC

Propose 200~400 fb<sup>-1</sup> integrated Luminosity scanning

Scan range : 342GeV~350GeV

#### 5. New Physics at the TTbar run, reported by Yaquan Fang

Yaquan introduced that besides of the top threshold scan and Higgs running at high energy, the TTbar run can also benefit new physics study, for example, deviation of the measurement of the coupling of top and Z/gamma from SM, some new physics models (H→sh (2HDM+S)). Our theorist colleagues have done a lot of work about high energy run at e+e- collider

#### General Comments:

- 1) Everyone agree that TTbar run is better for Higgs width, because it has more Higgs events and so on. We need to present our proposal at CEPC Steering Committee meeting, clarifying why we need to run at high energy, 360/365/370 which one and what lumi we need.
- 2) The 360/365 GeV may affect the Higgs self coupling, because cors section is different when energy change. We need to study and compare the result for Higgs self coupling at different energy.
- 3) Joao suggested to follow up this topic for next week. Cen Zhang will give a talk to introduce the physics motivation running at higher energy.
- 4) Yaquan suggested to organize a specific meeting among theorist and physics people, to deeply discuss the TTbar running.