Minutes of discussions on criteria to down-select calorimeter options

Date/Time: Feb. 4, 2024 (15:30 – 17:00 Beijing Time)

Agenda: <https://indico.ihep.ac.cn/event/21571/>

Participants: Fangyi Guo (minutes), Jianbei Liu (chair), Yong Liu, Manqi Ruan, Sen Qian, Shengsen Sun, Huaqiao Zhang, Yunlong Zhang

Introduction (Jianbei):

* Decide the options in the Ref-TDR, converge to fewer options to save the person power.
* Criteria and considerations (Yong):

Physics performance:

BMR

EM/hadronic energy linearity and resolution

Separation power

Pi-0 reconstruction

Cost:

Availability, possible risks

Technical maturity (special for TDR):

Technical readiness level (TRL score).

* Discussions:

Manqi:

BMR is a global performance, but not physics benchmark.

Pi-0 is pi-0 in the jets, also PID in the jets and jet-ID are also good topics.

In Z pole: timing pile-up between events. Need timing ability in some special channels (sub-ns level ?).

Integration: power, cooling, DAQ -> Consider these in TRL.

Innovativeness, readiness,

List the bottleneck in each option.

Jianbei:

Decouple the technical maturity.

A Ref-TDR is not a perfect TDR. (Manqi: a demonstration level for the concepts)

Phys: should list the priority: Higgs->flavor->etc.

Software: must have full detector simulation performance.

Tech: Must have R&D.

List for each option:

Physics performance (BMR, pi0, pile-up, etc.)

Full simulation status

Cost

Summarize the status of each option.

Uniform the boundary conditions: inner R=1.8m, Z=5m.

Mechanism, electronics, power estimation, total cost.

Huaqiao:

Consider at the low-level, 1st-principle key issue, and keep in mind in the potential development in next 10 years.

About BMR: does not depend on calorimeter only, also depends on algorithm, ECAL, HCAL, etc. (Manqi: can have decompensation in each calorimeter design, provide basic, benchmark, limit performance. Should find the bottleneck) (Jianbei: we do not start from 0. Should correlate with other systems.)

(Summarized by Yong) Consider the upstream system material.

Experience of CMS HGCAL TDR: HGCAL do not have PFA, but win with radiation resistance technics.

Suggest to decouple the BMR and only compare the key contribution from calo.

Sen:

Not fair for new concepts to compete with some others mature design.

To summarize the status before New Year vacation. Investigate the cost, re-convene next meeting after the vacation (tentatively on Feb. 23, 2024).

Will involve mechanics and electronics colleagues into further discussions