

# Feasibility study of combining a MIP Timing Detector with the Dual-Readout Calorimeter at future $e^+e^-$ colliders

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Dual-readout calorimeter (DRC) has been developed by DREAM and RD52 collaborators for last 20 years. It offers high-quality energy measurement for electromagnetic particles, hadrons and jets which is essential for the successful future lepton collider experiment [1]. CEPC (China) and FCC-ee (CERN) projects, the next  $e^+e^-$  colliders for Higgs factory and other electroweak processes, are under discussion by world-wide HEP community as a next generation experiment. The DRC has been proposed as a calorimeter of the IDEA detector concept published in Conceptual Design Reports of both future collider projects [2, 3]. The DRC would meet sufficient performance required by the CEPC and FCC-ee to achieve high precision measurements and indirect new physics searches.

Detectors to precisely measure the time of minimum ionizing particles are included in the HL-LHC upgrades for both ATLAS and CMS experiments [4]. These detectors will provide precision timing information with 30-40 ps resolution and help to reconstruct primary vertex precisely under an average of 200 collisions or more. The timing detectors in the endcap

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regions are based on LGAD technology [5, 6], which will be used in this study.

Combining the timing information from an LGAD-based timing detector with the DRC is expected to improve the functionalities and performances of the DRC. Therefore, we propose the feasibility study for combining information from two detectors. Particularly, the following items are under consideration:

- particle identification,
- improved timing information of the DRC,
- non-conventional physics cases such as long-lived particles and displaced jets.

## References

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