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Detector design for a multi-TeV muon collider

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The design of a feasible multi-TeV Muon Collider facility is the mandate of the international Design Study based at CERN and is considered with great interest along the presently on-going US SnowMass process. The physics potential of such a novel future collider is overwhelming, ranging from discovery searches to precision measurements in a single experiment. Despite the machine-design challenges it is possible to reach the uncharted territory of 10 TeV center-of-mass energy or higher while delivering luminosity up to a few $10^{35} \text{ cm}^{-2} \text{ s}^{-1}$.

The experiment design, the detector technology choices along with the reconstruction tools are strongly affected by the presence of the Beam Induced Background (BIB) due to muon beams decay products interacting at the Machine Detector Interface (MDI).

Full simulation studies at $\sqrt{s} = 1.5$ and 3 TeV, adopting the CLIC experiment technologies with important tracker modification to cope with BIB, are the starting point to optimize the detector design and proposing future dedicated R&Ds. Present results and future steps will be discussed.

Collaboration

IMCC

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