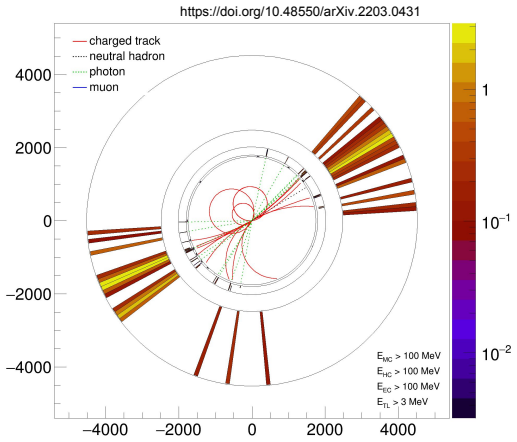
INFN

NAPOLI




# Calorimetry at Future Colliders

## 25 May 2023, 10:00 a.m., Aula Caianiello

The European Strategy for Particle Physics has identified an $e^+e^-$ Higgs factory as the highest priority next collider to address the fundamental physics questions which remain open. The international community has started to organize the R&D efforts to study the feasibility of such a collider, identify physics-driven detector requirements and the design of next generation particle detectors of which calorimeters represent a central system.

### A hybrid dual-readout segmented calorimeter for future e+e- Higgs factories
### Marco Lucchini, University of Milano Bicocca, INFN Milano Section

The long history of crystal homogeneous calorimeters in pushing the frontier of high energy resolution measurements for EM particles proves that homogeneous EM calorimetry represents a unique opportunity compared to other sampling calorimeter technologies. Furthermore, recent technological developments in the fields of crystal manufacturing and photodetector developments (SiPMs) have opened new perspectives on how a segmented crystal calorimeter with dual-readout capabilities could be exploited for particle detectors at future collider experiments.

In this seminar, I will discuss how a EM crystal calorimeter can be cost-effectively integrated with the fiber-based calorimeter of the IDEA detector to achieve an energy resolution of $3\%/\sqrt{E}$ for EM particles and $27\%/\sqrt{E}$ for neutral hadrons.

I will also show how the extension of the dual-readout method in such a longitudinally segmented hybrid calorimeter can achieve an energy resolution close to 5% for 50 GeV jets, discuss the potential of such a calorimeter in the context of future particle flow algorithms and illustrate the technological challenges that needs to be addressed to make its realization possible.

### Overview of dual-readout calorimetry status and development plans for future electroweak factories.
### Roberto Ferrari, University of Pavia, INFN Pavia Section

At present, hadronic shower energy measurements are heavily limited by the event-by-event fluctuations of the electromagnetic shower fraction. Based on the simultaneous measurement of scintillating (S) and Cherenkov (C) light, the dual-readout calorimetric technique is one of the solutions proposed for overcoming this problem and compensating for it, on an event-by-event basis.

In this seminar, we will quickly review the work done so far on dual-readout calorimeters and show their impressive potential, in particular when coupled with a highly granular readout system. On top of that, time measurements may complement the 2D imaging capabilities of a fibre-sampling calorimeter and provide information on the shower longitudinal profile.

The development plans and the expected performance will be described in the context of the IDEA proto-experiment proposed for future circular electroweak factories (FCC-ee and CEPC).