

Crilin: a semi-homogeneous crystal calorimeter for the muon collider

A muon collider is being proposed as a next generation facility. The incredible physics potential comes at the cost of technological challenges due to the short muon lifetime. From the detector side, the beam-induced background, produced by the muon decays in the beams and subsequent interactions, may potentially limit the physics performance. As an example, a diffused flux of photons and neutrons passes through the calorimeter system, which thus requires a design to avoid this substantial background. The Crilin calorimeter is being studied as a valuable option for the muon collider electromagnetic calorimeter: it is a semi-homogeneous calorimetric system with Lead Fluoride (PbF₂) crystals interfaced with Silicon Photomultipliers (SiPMs).

In this talk the simulation studies towards the Crilin design are presented. The Crilin performance is discussed, as well as the impact of the beam-induced background.

The experimental tests on a prototype, consisting of two layers of 3x3 PbF₂ crystals each, performed using 450 MeV electrons at the LNF Beam Test Facility and 40-150 GeV electrons at CERN H₂, are also presented. These tests are fundamental to demonstrate that the requirements established with the muon collider simulation are achieved by the Crilin technology.

Primary authors: SAPUTI, Alessandro (Istituto Nazionale di Fisica Nucleare); GIRALDIN, Carlo (Padova); CANTONE, Claudio (Istituto Nazionale di Fisica Nucleare); PAESANI, Daniele (Istituto Nazionale di Fisica Nucleare); ZULIANI, Davide (Istituto Nazionale di Fisica Nucleare); TAGNANI, Diego (Istituto Nazionale di Fisica Nucleare); LUCCHESI, Donatella (Istituto Nazionale di Fisica Nucleare); DIOCIAIUTI, Eleonora (Istituto Nazionale di Fisica Nucleare); DI MECO, Elisa (Istituto Nazionale di Fisica Nucleare); LEONARDI, Emanuele (Istituto Nazionale di Fisica Nucleare); COLAO, Francesco (ENEA); PEZZULLO, Gianantonio (Yale University); SARRA, Ivano (Istituto Nazionale di Fisica Nucleare); SESTINI, Lorenzo (Istituto Nazionale di Fisica Nucleare); MOULSON, Matthew David (Istituto Nazionale di Fisica Nucleare); PASTRONE, Nadia (Istituto Nazionale di Fisica Nucleare); GARGIULO, Ruben; CERAVOLO, Sergio (LNF)

Presenter: GIRALDIN, Carlo (Padova)

Session Classification: Nuove tecnologie