

Cherenkov luminometer R&D (CMS BRIL) Test Beam 2022

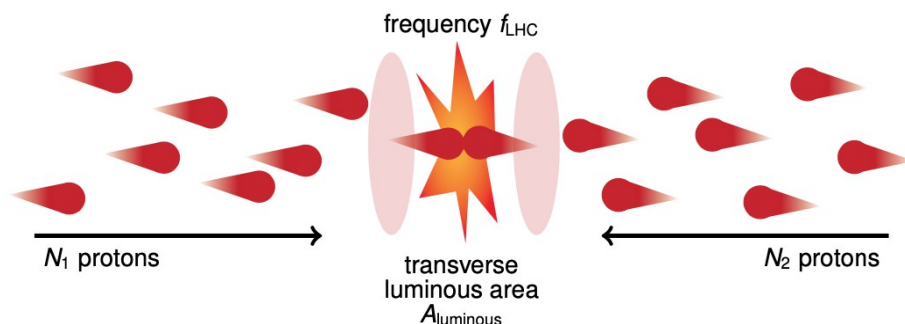
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Introduction

■ Cherenkov luminometry:

- ▶ an attractive solution for modern and future collider experiments where radiation resistance for the system is a critical aspect and the fast signal response is well matched to the high repetition rate of crossing bunches.
- ▶ A precise knowledge of the integrated luminosity of a collision data set is a crucial requirement for precision cross section measurements.
- ▶ The Cherenkov luminometer LUCID has operated in the ATLAS experiment at the LHC since Run 1.
- ▶ Currently, a Cherenkov luminometer, PLUME, is under development for the LHCb experiment for Run 3.
- ▶ A similar approach for a standalone precise bunch-by-bunch luminometer is considered for the CMS experiment at an R&D stage.
- ▶ The calibration and monitoring of the PMTs is based on the monitoring of the peak from the primary tracks originating from the IP



$$\frac{dN}{dt}(pp \rightarrow X) = \mathcal{L} \cdot \sigma(pp \rightarrow X)$$

$$\mathcal{L} = \frac{N_1 N_2 f_{LHC}}{A_{luminous}}$$

Beam requirements

■ Particles and energies:

- ▶ Electrons, muons and if possible pions: 100-180 GeV

■ Beam conditions

- ▶ Polarity: any
- ▶ Intensity of 10'000 [Hz]
- ▶ beam size [mm] < 10x10
- ▶ beam spot size of ~1.5 cm radius
- ▶ 2.5x2.5 cm² scintillator is used for triggers

Infrastructure

- Small Cherenkov counters based on fused silica coupled to various types of PMTs and SiPMs with some absorber will be tested.
- Envelope of the setup. 50x50cm and weight is ~5 kg
 - ▶ 230V single phase 16 A.
 - ▶ No need any special connectors.
 - ▶ No additional racks in case H2 is used otherwise one rack.
 - ▶ Moveable (DESY) table

Thank you for your attention!