

R&D on Radiation-Tolerant Organic Scintillators for High-Energy Physics Experiments

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Plastic scintillators are widely used in high-energy physics detectors due to their low cost and ease of production. In high-rate environments, there is a need for scintillating plastics that can withstand high radiation doses while preserving fast time performance, as in the case for the upgrade of LHCb Electromagnetic calorimeter where plastics are required to sustain 200kGy [1].

Intensive R&D activities have recently started to explore various options that aimed at improving the performance of organic scintillators. These efforts include the optimization of material composition and dye concentration. They also involve the investigation of different radiation-hard host materials, for example Polysiloxane hosts [2]. In addition, innovative dyes such as Coumarin and Perylene are being explored [3].

This contribution will present an ongoing R&D on radiation-tolerant organic scintillators. The study of optical, scintillation and radiation hardness properties, particularly the results of an irradiation campaign conducted at CERN IRRAD proton facility, on a series of various types of plastic scintillators (plates and fibres) will be presented, highlighting the optimized compositions.

1. LHC Collaboration, “LHCb Upgrade II Scoping Document“, LHCb-TDR-026 (2025)
2. A. Quaranta et al., M.C.P. 137 951-958 (2013)
3. M. Gandini, I. Villa, M. Beretta et al., “Efficient, fast and reabsorption-free perovskite nanocrystal-based sensitized plastic scintillators“, *Nat. Nanotechnol*, 15, 462–468 (2020)

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